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The Geology of Keefer, Denton, and Thorneloe Townships District of Cochrane

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Geology of Keefer, Denton, and Thorneloe Townships District of Cochrane

by

A.D. Choudhry

1989

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V.G. Milne

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CONTENTS

Abstract....................................xvii

Introduction....................................1
- Topography and Drainage....................................1
- History of Mineral Exploration....................................2
- Previous Geological Work....................................3
- Present Geological Survey....................................4
- Acknowledgments....................................5

General Geology....................................6

- Early Precambrian (Archean)
- Metavolcanics....................................8
  - Ultramafic to Mafic Metavolcanics....................................8
  - Mafic to Intermediate Metavolcanics....................................14
  - Felsic to Intermediate Metavolcanics....................................20
  - Petrochemistry of Metavolcanics....................................27
- Metasediments
  - Chemical Metasediments....................................29
  - Clastic Metasediments....................................32
    - Conglomerate-Wacke Association....................................32
    - Wacke-Siltstone Association....................................34
- Metamorphosed Mafic and Intermediate Intrusions....................................37
  - Gabbro and Diorite....................................37
  - Quartz Diorite Stock....................................39
- Intermediate to Felsic Intrusive Rocks....................................40
  - Quartz Diorite, Quartz Monzodiorite, and Tonalite....................................41
  - Porphyritic Granodiorite....................................42
  - Leucocratic Granodiorite....................................43
  - Quartz-Feldspar Porphyries....................................44
- Middle and Late Precambrian
  - Diabase Dikes....................................45
- Cenozoic
- Quaternary
- Pleistocene and Recent....................................47

Stratigraphy....................................48

Metamorphism....................................50

Structural Geology....................................51
- Bedding and Foliation....................................51
- Joints....................................52
- Folds....................................52
- Faults....................................53

North-trending Faults.....................................54
Northwest-trending Faults.................................54
Northeast- to East-trending Faults........................54

Correlation of Lithologies and Aeromagnetic Data..................55

Economic Geology..57

Mineral Occurrences...58
Gold and Silver...58
Iron..59
Base-metal Sulphides..59
Nickel-Chromium...60
Asbestos..60

Description of Properties...60

Acme Gas and Oil Company Limited..............................60
Aumo Porcupine Gold Mines Limited.............................61
Bartleman Estate..64
Brown McDade Mines Limited....................................66
Canadian Nickel Company Limited...............................67
Cominco Limited...70
Derby, G..70
Dodds, T..71
Dominion Gulf Company [1950]..................................72
Dominion Gulf Company [1951]..................................72
Ellery, C.R...73
Falconbridge Nickel Mines Limited.............................74
Gagnon Property...74
Galata, F...75
Gambit Consolidated Explorations Limited......................78
Gertie Gold Syndicate...79
Goldale Mines Limited...81
Gowest Gold Resources Limited.................................81
Hollinger Consolidated Gold Mines Limited [1956]..............82
Hollinger Consolidated Gold Mines Limited [1957]..............84
Bristol-Thorneloe Claim Group.............................84
Denton-Thorneloe Claim Group..............................85
Hollinger Consolidated Gold Mines Limited [1960]..............86
Hollinger Consolidated Gold Mines Limited [1961]
Kenogamissi Lake Group....................................86
Hollinger Consolidated Gold Mines Limited [1962]
Redsucker Claim Group.....................................87
Hollinger Consolidated Gold Mines Limited [1962]
Cripple Creek Claim Group.................................89

Hollinger Consolidated Gold Mines Limited [1962]..............90
Hollinger Consolidated Gold Mines Limited [1965]..............91
Hollinger Consolidated Gold Mines Limited [1967]
    Mahoney Creek Group...................................92
Hollinger Mines Limited.......................................95
Hollinger Argus Limited.......................................96
Jacomo Mines Limited..97
Jessie James Mines Limited....................................99
Jowsey Denton Gold Mines Limited..............................99
Maridian Mines and Exploration Company Limited...............100
Maryland Gold Mines Limited..................................102
    History..102
    General Geology..103
McCoshen...105
Mill Hill Mines Limited......................................105
Moore..107
O'Neill, B...107
Paymaster Consolidated Mines Limited.........................108
Paymaster Consolidated Mines Limited.........................109
Phillip, A.E...110
Porcupine Quartet Gold Syndicate.............................111
Pyke, D.R..112
    Thorneloe East Property..................................114
Reid, S..115
Reid, S..115
Scott..116
Sheehan, P...117
Simpson-Marcot...117
Schnubb, E...118
Sturgex Mines Limited..118
Swanson, A...118
Texas Gulf Sulpher Company Incorporated......................119
Texasgulf Canada Limited.....................................120
Thilbeault, Y..120
Thompson, C..122
Verity Porcupine Gold Mines Limited..........................122
Vizina, A..123
Wakemac Denton Gold Mines Limited.............................123
Whitmarsh, B...126

Suggestions for Further Exploration..........................127

References...128

Photographs..134

List of Properties..140

Metal and Mineral Abbreviations.......................................143

Legend..144

Sources of Information..148

Tables..149

Figures...159

Map P.2500..back pocket
Map P.2501..back pocket
Map P.2502..back pocket

LIST OF PHOTOGRAPHS

1. Flow contact in peridotitic komatiite....................134
2. Polysuturing in peridotitic komatiite....................134
3. Stripped and trenched zone of Gowest Gold Resources Limited....................135
4. Pyroxene spinifex in pyroxenitic komatiite....................135
5. Photomicrograph of pyroxenitic komatiite....................136
6. Photomicrograph of basaltic komatiite....................136
7. Pillowed andesite in northeast Keefer Township....................137
8. Andesitic pillow breccia southeast of Carlton Lake....................137
9. Photomicrograph of recrystallized tuff....................138
10. Conglomerate east of gravel road in Denton township....................138
11. Photomicrograph of fine-grained arkose....................139
12. Elongated clasts in conglomerate north of Wawaitin Dam....................139

LIST OF TABLES

1. Table of lithologic units....................149
2. Chemical analyses of samples collected from the map area....................151
3. Mineral modes of intrusive rocks....................156
4. Summary of exploration work in the map area....................157

LIST OF FIGURES

1. Jensen Cation Plot of volcanic rocks from the map area....................159
2. Total alkalies versus silica plot for the rock samples from the map area....................160
3. Modal mineral proportions of intrusive rocks plotted according to Streckeisen (1976)....................161

4. Sketch map of the major structural features in the map area....................................back pocket

5. Sketch map of Keefer Township showing claims in good standing..162

6. Sketch map of Denton Township showing Claims in good standing..163

7. Sketch map of Thorneloe Township showing claims in good standing...164

ABSTRACT

This report describes the lithology, stratigraphy, structure and mineral occurrences of the townships of Keefer, Denton and Thorneloe that together comprise an area of approximately 280 km^2 (108 square miles) in the District of Cochrane about 25 km southwest of Timmins.

With the exception of Middle Precambrian diabase dikes the remainder of the rocks in the map-area are Early Precambrian in age. Thick deposits of Pleistocene clay, sand and gravel cover the bedrock.

The Precambrian bedrock consists of a sequence of ultramafic, mafic, and intermediate to felsic metavolcanic rocks with abundant intercalated ironstone and volcanogenic metasediments. Ultramafic rocks form the base of the volcanic sequence. They are overlain by mafic to intermediate metavolcanic rocks which in turn are overlain by intermediate to felsic metavolcanic rocks. The total thickness of the sequence is approximately 2200 m. The metavolcanic sequence is overlain by metasedimentary rocks consisting of conglomerate, wacke, and siltstone. Minor gabbroic and dioritic bodies intrude the metavolcanic-metasedimentary sequence.

All these rocks were isoclinally folded and overturned to the south about roughly west-trending, steeply dipping axial planes having easterly plunging fold axes.

Intermediate to felsic intrusive rocks in the area include quartz diorite to tonalite and coarse-grained, equigranular to porphyritic granodioritic plutons.

Metamorphism in the area ranges from lower greenschist facies rank in the interior of the metavolcanic-metasedimentary belt to higher greenschist facies rank near the contact with the intrusive rocks.

Economically interesting showings of gold-silver, nickel-chromium, sulphides and asbestos are present in the map-area. More than 45,000 tons of gold ore reserves, grading an average of 0.21 ounces per ton, are reported from the Aumo Porcupine Gold Mines Limited Property in Denton and neighbouring Carscallen Townships.

GEOLOGY OF KEEFER, DENTON, AND THORNELOE TOWNSHIPS

by

A.D. Choudhry [1]

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[1] Geologist, Precambrian Geology Section, Ontario Geological Survey, Toronto.

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GEOLOGY OF KEEFER, DENTON, AND THORNELOE TOWNSHIPS

District of Cochrane

by

Abdul G. Choudhry

INTRODUCTION

The map area is bounded by Latitudes 48° 16' 30"N and 48° 22'N and Longitudes 81° 28'W and 81° 51' 25"W and covers an area of approximately 280 km2. It includes the townships of Keefer, Denton and Thorneloe. The town of Timmins is approximately 25 km to the northeast and Foleyet is approximately 75 km to the west. Highways 101 and 144 both pass through the area. Additional access within the map-area is provided by numerous gravel roads built for logging-haulage purposes that extend off the highways. The road leading from Timmins to Wawaitin Falls provides access to the area located southeast of Kenogamissi Lake. The northwestern and southeastern parts of the area can be reached by boat through Opishing and Kenogamissi Lakes respectively. With the exception of the Tatachikapika River the streams in the area are not navigable.

TOPOGRAPHY AND DRAINAGE

The low relief of the map-area is evidenced by a level surface of sand and gravel with low rock exposures and mounds of glacial debris. The altitudes of most lakes are between 305 m and 335 m above sea level. The highest hill in the area, situated between Highway 101 and Godon Lake in Denton Township has a maximum relief of 61 m. Eskers (not plotted on map-face) near Star Lake and Keefer Lake attain heights of about 30 m.

Glacial deposits cover more than 90 percent of the map-area. Bedrock exposure is low and patchy. Large areas of cedar swamp and muskeg occupy the low ground of the map-area.

The map-area lies within the Hudson Bay Drainage Basin. The streams and Lakes in the area drain into the Mattagami, Tatachikapika and Kamiskotia Rivers all of which have cut deep channels in the glacial deposits. These rivers flow north into Hudson Bay.

Much of the area was cut-over a number of years ago resulting in a second growth of tangled bush which is often difficult to traverse. A good growth of jackpine covers old burned-over areas.

HISTORY OF MINERAL EXPLORATION

Since the discovery of gold at Porcupine in 1909, mineral exploration in the area has been sporadic. Prospecting has been mainly directed towards the discovery of gold. A number of old patented claims are located within the map-area. Except for minor production from Thibeault Claims, (see List of Properties, this report) there are no past or present producing mines in the area.

Most of the mineral exploration programs in the 1930's and 1940's involved stripping, trenching and shallow diamond drilling on gold-bearing quartz and quartz-carbonate veins in shear zones. A new and major phase of mineral exploration, using sophisticated geophysical instruments, started in the 1950's and has continued to the present day. From 1950 to the present Hollinger Argus Limited (previously Dominion Gulf Company before

1955, Hollinger consolidated Gold Mines Limited 1955-1967, Hollinger Mines Limited 1967-1980) has been active in the area and carried out ground magnetometer and electromagnetic surveys together with diamond drilling in various parts of the area. Paymaster Consolidated Mines Limited conducted ground magnetometer and electromagnetic surveys in 1961 and Acme Gas and Oil Company Limited flew an airborne electromagnetic survey in 1966 over parts of Denton and Thorneloe Townships.

From 1970 to 1980 Texas Gulf Sulpher Company Incorporated, Falconbridge Nickel Company Limited, Canadian Nickel Company Limited and many other companies and individuals were active in different parts of the area in their search for gold and base metal mineralization.

PREVIOUS GEOLOGICAL WORK

The earliest documented work in the area is by A.G. Burrows (Burrows 1911) who while making a geological examination of the Porcupine Gold Area, examined some outcrops along the northern township line of Thorneloe Township. In 1911 (Burrows 1912) he mapped rocks exposed in various claim groups in Denton Township. W.R. Rogers and E.L. Bruce (Rogers and Bruce, 1912) made a partial survey of the Cripple Creek Gold Area in Denton Township and described the geology along the principal water routes. E.D. Todd (Todd, 1923) examined the rocks along canoe routes and delineated the metavolcanic-metasedimentary belt in Keefer and Denton Townships. J.E. Hawley (Hawley, 1926), while mapping Carscallen, Bristol and Ogden Townships to the northeast of the present area, examined some claims in Denton Township. W.D.

Harding and L.G. Berry (Harding and Berry, 1939) mapped the townships of Keefer, Denton, Thorneloe, Price, Adams and Eldorado at a scale of 1:63 360. S.A. Ferguson (Ferguson, 1959a, 1959b, 1959c) using information provided by mining companies and ODM-OGS aeromagnetic maps, compiled the geology of Keefer, Denton, Thorneloe and Price Townships at a scale of 1:15 840.

Geological mapping in the townships bordering the map-area have been made by S.A. Ferguson (Bristol Township; Ferguson, 1959d), V.G. Milne (Kutatush-Sewell Lake Area; Milne 1972) and W.J. Wolfe (Kamiskotia-Whitesides Area, Wolfe, 1971).

Keefer, Denton and Thorneloe Townships are covered by geological compilation maps 2046 and 2205 (at a scale of 1:254 440) by Ginn et al. (1964) and Pyke et al. (1973) respectively. Aeromagnetic maps 2299G and 293G, issued by ODM-GSC in 1964 and 1970, respectively, provide aeromagnetic coverage of the map-area.

From the early 1900's to the present, extensive geological work has been carried out by individual prospectors and various mining companies in the search for gold and base metals. Table 4 provides a listing of assessment work submitted to the Ontario Geological Survey Assessment Files Research Office, Toronto and Regional Geologist's Files, Ontario Ministry of Natural Resources, Timmins.

PRESENT GEOLOGICAL SURVEY

Geological mapping in the field was carried out by the author and his assistants between May 22 and August 20, 1981. The field map were prepared at a scale of 1:15 840 on cronaflex base maps prepared by the Cartography Section, Surveys and Mapping Branch, Ontario Ministry of Natural Resources.

The geological data in the field were plotted on acetate overlay sheets attached to vertical aerial photographs (scale 1:15 840) provided by the Airphoto Library, Ministry of Natural Resources. Traverses by pace-and-compass were planned to cover outcrops shown on the previous geological maps of the area and potential outcrops identified from the aerial photographs. The geology of the map-area is not tied to surveyed lines.

Selected rock specimens were submitted to the Geoscience Laboratories, Ontario Geological Survey for chemical analysis and assays. About 100 selected rock samples were cut for thin sections for petrographic studies.

ACKNOWLEDGMENTS

Assistance in the field was provided by R.S. Epstein, S.S. McRoberts, P.G. Miller and K.L. Topola. R.S. Epstein in the first half of the field season, as a senior assistant, was responsible for independent mapping. In the second half S.S. mcRoberts and P.G. Miller mapped parts of Keefer Township.

Mr. L.E. Luhta Resident Geologist at Timmins and his staff are gratefully acknowledged for their help during the field season. The author is also thankful to the staff of the Timmins District Office, Ministry of Natural Resources, for their help and cooperation. Discussions with Mr. C.D. McKenzie of Hollinger Argus Limited and Ronald J. Bradshaw, Professional Geologist, Timmins were helpful in gaining information on past exploration activities in the map-area.

GENERAL GEOLOGY

The bed rock in the map-area consists of an Early Precambrian metavolcanic-metasedimentary sequence that comprises a part of the Abitibi Subprovince of the Superior Province. Small elliptical stocks and sills of mafic to intermediate intrusive rocks cut the metavolcanic-metasedimentary rocks. The supracrustal rocks were intruded by Early Precambrian intermediate to felsic intrusive rocks. Diabase dikes cut all the rocks in the map-area. Much of the bedrock is now covered by glacial till, glaciofluvial and glaciolacustrine sand, gravel and clay deposited during ice retreat of the Wisconsinan glaciation (Boissonneau, 1965).

The oldest rocks in the area are ultramafic flows, some of which contain polysutured pillows. They are intercalated with locally derived metasedimentary rocks and basaltic komatiitic flows. These rocks are succeeded upwards by massive and pillowed tholeiitic flows. A thick sequence of calc-alkalic mafic and intermediate to felsic metavolcanic rocks overlies the tholeiitic rocks and in turn are overlain by clastic metasedimentary rocks. The basaltic rocks are dominantly amygdaloidal to vesicular, pillowed and massive flows but also include minor pyroclastic rocks. The intermediate to felsic metavolcanic rocks consist of massive to porphyritic flows, tuff, lapilli-tuff and tuff-breccia. The pyroclastic rocks are poorly to well bedded and grade along strike and stratigraphically upwards into laminated to subfissile tuffaceous wackes and clastic metasedimentary rocks. The clastic metasedimentary rocks consist of polymictic pebble to boulder conglomerate with a wacke matrix; fine-to medium-grained wacke and arkosic wacke; and pale to dark coloured siltstone and mudstone. A zone of chemical metasedimentary rocks consisting of chert and magnetite, magnetite and epidote; and chert, pyrite and pyrrhotite occurs interbedded with the intermediate to felsic metavolcanic rocks or at their contact with the clastic metasedimentary rocks.

A medium-grained recrystallized stock of quartz diorite to diorite composition intrudes the supracrustal rocks in Keefer Township. Intermediate to felsic intrusive rocks are of three different ages. The oldest are pink to grey quartz diorite, tonalite, quartz monzodiorite and equivalent gneisses that underlie most of Keefer Township and the western parts of Denton Township. A pink porphyritic granodiorite, with up to 3 cm long K-feldspar crystals, underlies a part of southern Denton Township. A pink medium-grained, granodiorite to granite intrudes the porphyritic granodiorite.

Middle to Late Precambrian diabase dikes (Leech 1965, see Ferguson 1968) trend approximately north to north-northwest and intrude all other rock units.

Metamorphism throughout the area is generally to the greenschist facies rank. Metavolcanic and metasedimentary rocks near the intermediate to felsic intrusive rocks have been contact metamorhosed to the albite-epidote hornfels to lower hornblende hornfels facies rank.

Isoclinal folding of the supracrustal rocks has produced a series of roughly east-trending folds with often steeply north-dipping axial planes and easterly plunging fold axes. There are three major fault sets. The north-and northwest-trending faults are younger than the northeast-to east-trending faults.

EARLY PRECAMBRIAN (Archean)

Metavolcanics

The ultramafic metavolcanic rocks were distinguished from mafic metavolcanics in the field, on the basis of colour index, colour of weathered surface, hardness and the presence or absence of polysuturing and spinifex textures. All those rocks that weather light blue-grey or grey-green to orange-brown in colour, have low hardness and show polysuturing and/or spinifex texture are classified as ultramafic metavolcanic rocks. Basaltic komatiite is comparatively more grey-green in colour, and softer than the other basaltic rocks of theoleiitic and calc-alkalic affinity and often shows polysuturing.

Mafic to intermediate metavolcanic rocks have a colour index greater than 20 and a composition of basalt and andesitic basalt. Felsic to intermediate metavolcanic rocks differ from mafic to intermediate metavolcanics in having a colour index less than 20 and a composition of andesite, dacite, rhyodacite and rhyolite.

Ultramafic to Mafic Metavolcanics

With the aid of field characteristics and thin-section studies, the ultramafic to mafic metavolcanic rocks can be subdivided into: (1) peridotitic komatiite that weathers rusty brown to orange-brown and is dark grey to black on the fresh surface; (2) pyroxenite komatiite that is light blue-grey to grey on both the weathered and the fresh surfaces and (3) basaltic komatiite that weathers light grey-green on the fresh surface. In handspecimen the last two rock types are sometimes difficult to separate, especially when plagioclase in the basaltic komatiite has altered to epidote.

A sequence of ultramafic to mafic flows located southwest of the junction of Cripple and Mahoney Creeks in Denton Township consists of 1) a lower section of predominantly peridotitic komatiitic massive and pillowed flows, 2) peridotitic komatiitic massive and pillowed flows with lesser amounts of pyroxenitic komatiitic flows; 3) dominantly pyroxenitic komatiitic massive flows interbedded with lesser amounts of peridotitic massive and pillowed flows and 4) an upper section of basaltic komatiitic massive and pillowed flows.

A similar but not as well developed sequence is present on the east side of Mahoney Creek where peridotitic komatiitic forms the northwestern outcrops and basaltic komatiite the southern and southeastern outcrops.

Peridotitic komatiite forms both massive and pillowed flows though the latter are not common. The massive flows vary from 1 to 5m in thickness. The lateral extent of the flows is not known due to poor exposure. There is generally a slight increase in grain size towards the centre of thicker flows. Two to four millimetre wide chert layers are often present between flows (Photo 1). Flow tops often consist of flow breccia with 10 to 30 cm angular fragments while the bottom is often chilled and fractured.

The pillows are oval to elliptical in shape and vary from 15 cm to 1 m in diameter. The outcrop on Highway 144, south of the Tatachikapika River consists of medium-grained peridotitic komatiite which grades northward into fine-grained distorted pillows. Massive, well jointed peridotitic komatiite comprises the center of the flow and contains numerous veins of picrolite (fibrous serpentine). The veins which tend to occur within or near shear zones in the peridotitic komatiite contain from 2 to 40 cm long picrolite fibers.

Polysuturing, characteristic of ultramafic rocks (Pyke, 1980, p. 47) is quite common (Photo 2). The semi-equant polygons are 2 to 30 cm in diameter and their boundaries are outlined by a slightly elevated dip. Spinifex texture, however, was not observed in the peridotitic komatiite. In thin-section the original mineralogy of the peridotitic komatiite has been partly to completely altered. The rock is composed of 35 to 65 percent tremolite, 10 to 15 percent talc, 15 to 25 percent chlorite, 0 to 15 percent serpentine, about 5 percent magnetite and variable amounts of carbonate. The tremolite forms approximately 0.5mm long fibrous aggregates which enclose minute remnants of original pyroxene. At places the tremolite has further altered to chlorite and/or talc but the pyroxene crystal outlines are still preserved. Antigorite serpentine has replaced the original enhedral to subhedral approximately 0.5 mm long olivine crystals. Chlorite occupies the interstitial positions between the former olivine and clinopyroxene crystals. It forms lamellar aggregates and encloses acicular to anhedral magnetite which probably was formed from iron released during the alteration of the ferromagnesian minerals to chlorite. Primary magnetite grains are rare and are partially altered to leucoxene. The medium-grained rock in the flow center at Highway 144 contains about 45 percent fibrous to scaly antigorite serpentine aggregates which enclose fibrous talc and lamellar chlorite aggregates. Carbonate-rich areas consisting of aggregates of subhedral to anhedral grains form about 30 percent of the rock. Anhedral elongated grains of magnetite of secondary origin are mostly associated with chlorite.

The pyroxenitic komatiitic flows appear to vary from 1 to 4m in thickness and are best exposed in the stripped and trenched zone on Gowest Gold Resources Limited Property (see Gowest Gold Resources Limited, List of Properties, this report), on Mahoney Creek, Denton Township (Photo 3). The flows are intercalated with up to 0-5 m thick mineralized metasedimentary beds that contain pyrite, arsenopyrite carbonate quartz and tourmaline. The flows extend about 20m east along strike where they are truncated by a diabase dike. On the other side of the dike the pyroxenitic komatiite is sheared to talc-chlorite-carbonate schist. The intercalated metasedimentary rock consists of dark-grey to black volcanogenic mudstone near the diabase dike but elsewhere consist of tuff-to agglomerate-sized angular fragments of ultramafic to mafic composition set in a fine-grained matrix. A quartzite lens about 75m thick is interbedded with ultramafic to mafic metavolcanics west of the junction of Cripple and Mahoney Creeks.

Polysuturing, so widespread in the peridotitic komatiite is not as common in the pyroxenitic komatiite. The semi-equant polygons, where present are usually 2 to 32 cm in diameter. Spinifex texture was observed in two outcrops where 2 to 8 cm long, randomly oriented tremolite blades occur in massive, polysutured pyroxenitic komatiite (Photo 4).

The pyroxenite komatiite has been altered to an assemblage consisting mainly of tremolite, serpentine, talc, chlorite, carbonate and leucoxene. Tremolite which varies from 65 to 80 percent forms fibers with a maximum length of 0.5 mm that occur in randomly oriented aggregates (Photo 5). These aggregates often occur as pseudomorphs after and thus preserve original pyroxene crystal outlines. Some of the tremolite fibers have been further altered to chlorite and/or talc. Antigorite which locally comprises approximately 15 percent of the rocks occurs as rounded aggregates of about 0.5 mm diameter. Although no crystal outlines are observed these aggregates could represent former olivine grains. Lamellar aggregates of chlorite which comprises from 5 to 10 percent of the rock occur enclosed by tremolite aggregates. Carbonate forms anhedral individual grains to grain aggregates and has interstitial habit. Subhedral primary magnetite is rare but secondary anhedral magnetite, formed from iron released during alteration of the ferromagnesian minerals, occurs enclosed in chlorite aggregates. Rare titanite forms minute subhedral to anhedral crystals in interstitial positions.

The basaltic komatiite flows range from 1 to 20 m in thickness. The thinner flows are fine rained while the thicker flows are medium grained near their central parts. The lateral extent of these flows could not be determined due to poor exposure. The upper parts of some of the flows are pillowed. The pillows are oval to ellipsoidal in shape and are approximately 0.2 to 1.5 m in maximum diameter. They have 1 to 1.5 cm thick selvages. Some pillows contain vesicles, or amygdules filled with carbonate, quartz and chlorite.

In thin-section basaltic komatiite consists of plagioclase laths (An_{66-70}) set in an assemblage of tremolite, serpentine, epidote, chlorite, carbonate and leucoxene (Photo 6). Plagioclase forms 0.5 mm long laths which rarely have recrystallized to albite and/or granular epidote. It comprises approximately 15 to 20 percent of the rock and occurs ophitically enclosed in ferromagnesian minerals. Tremolite is present in amounts of 45 to 65 percent and forms approximately 0.5 mm long fibrous aggregates. These aggregates often occur as pseudomorphs after and preserve the original pyroxene crystal outlines. Serpentine varies from 0 to 10 percent and occurs as rounded aggregates of about 0.5 mm in diameter which might represent former olivine grains. Lamellar aggregates of chlorite comprise 10 to 20 percent of the rock and occupy the space between the tremolite and plagioclase crystals. Carbonate occurs in anhedral individual grains as well as in grain aggregates that are sparsely distributed throughout the rock. Rare primary subhedral to anhedral magnetite grains show partial to complete alteration to leucoxene. Fresh irregular grains of magnetite, enclosed in chlorite aggregates, are of secondary origin formed during the alteration of the ferromagnesian minerals. Titanite forms rare subhedral to enhedral crystals.

Carbonatized komatiitic rocks situated on the gravel road, about 1 km northeast of Godon Lake and in outcrops on Cripple Creek contain abundant quartz veins and pods. Due to intense alteration it is difficult to determine whether the rock is an ultramafic flow or volcaniclastic detritus derived from erosion of ultramafic rocks. It is interbedded with angular tuff to agglomerate-sized ultramafic fragmental rocks which show crudely developed, thick to very thick bedding. Some outcrops are very strongly sheared to talc-sericite-carbonate schist.

In thin-section the carbonatized komatiite located 1 km northeast of Godon Lake consists of approximately 68 percent anhedral carbonate aggregates, about 15 percent equant quartz grains, about 10 percent muscovite and minor chlorite, hematite, magnetite and chromite. The rock contains 0.1 percent nickel and 0.19 percent chromium (analysis by Geoscience Laboratories, Ontario Geological Survey).

The carbonatized rock near Cripple Creek consists of about 70 percent aggregates of anhedral carbonate, 9 percent fibrous talc and lamellar chlorite intergrowths, and about 10 percent equant grains of plagioclase (An_{28}) and quartz. Anhedral magnetite is the only accessory mineral.

Mafic to Intermediate Metavolcanics

The mafic to intermediate metavolcanic rocks dominantly consist of basalt with minor basaltic andesite. Although metamorphism has obscured many of the subtle differences an attempt was made to subdivide these rocks into respectively; magnesium tholeiite, iron tholeiite, and calc-alkalic basalt and andesite. The various types were distinguished on the basis of hardness and colour of the rock in handspecimen, and their magnetic intensity both in handspecimen and as indicated by ground magnetic maps. Magnesium tholeiite is light grey-green whereas iron tholeiite is dark-grey to black. The latter is also moderately to strongly magnetic. Magnesium tholeiitic and calc-alkalic basalt can have similar colour though the latter shows a considerable variation in tone and is comparatively harder and more compact. The calc-alkalic basalts are also weakly magnetic. This subdivision of basaltic rocks is not used on the accompanying geological map, where they are simply classified as mafic to intermediate metavolcanic, due to poor exposure and the lack of supportive chemical data. In several locations, however, the author felt confident in distinguishing these flows on the basis of their chemical affinity and a brief description follows.

Magnesium tholeiite, west of the junction between Cripple and Mahoney Creeks, forms several successive lave flows that vary from 5 to 50 m in thickness. Generally the flows increase in thickness towards the top of the sequence. Thin flows (less than 10 m) are fine-grained and featureless while the central parts of the thick flows are coarse-grained. Flow contacts are poorly exposed. Pillows are common in the upper part of individual flows and often grade into pillow breccia and/or hyaloclastite. The flows vary from green-grey to green in colour. They are locally vesicular and/or amydaloidal.

In thin-section the rock consists of approximately 35-53 percent fibrous uralite that formed by alteration of original pyroxene. The plagioclase has altered to epidote (clinozoisite), albite, chlorite and calcite. The primary ophitic texture has been partially to completely destroyed by recrystallization. Magnetite and sphene are common accessories. A strong foliation in many thin sections is defined by parallel to subparallel alignment of chlorite and amphibole crystals.

Pillowed magnesium tholeiitic flows are common near the northwest corner of Thorneloe Township. They are present although not very abundant elsewhere. The pillows vary in size from 0.2 m to 1 m in diameter though 1.5 m diameter pillows were also seen. They have an oval to elliptical shape and have both radial and concentric cooling joints in their interiors. The pillows are closely packed with thin 0.5 to 0.75 cm thick dark-green, low-weathering selvages. A few pillows show a concentration of vesicles and amygdules at their tops.

Pillow breccia and hyaloclastite are common near the top of many flows. In the pillow breccia broken pillows are set in a matrix of hyaloclastite. Near the top of the flows the rock consists almost entirely of hyaloclastite material with rare broken pillows. Hyaloclastite, a compact rock consisting of 1 mm to 3 cm fragments, is grey to green-grey on fresh surface and weathers rusty brown. It forms a 20 cm to 2 m thick top to some of the massive flows.

In thin section the pillowed lava consists of very fine-grained fibrous actinolite, with a maximum length of 0.2 mm. It comprises 35 to 55 percent of the rock. Plagioclase laths, 0.2 mm to 0.5 mm in length have been partially to completely altered to epidote, albite and chlorite with minor carbonate. They comprise approximately 40 to 50 percent of the rock. Magnetite forms about 3 percent of the rock and occurs in the felted groundmass. Quartz, albite, chlorite and carbonate, all occur in minor amounts. The pillow breccias have a similar mineral assemblage as the pillowed lavas.

Dark green to black iron-tholeiitic flows and minor flow top breccia occur interlayered with magnesium-tholeiitic rocks in the northwest corner of Thorneloe Township. They also occur interbedded with felsic to intermediate metavolcanics immediately south of Warren Lake in Keefer Township and about 1.5 km northeast of Godon Lake in Denton Township.

The fine-grained massive flows are moderately to strongly magnetic. They weather dark brown green to rusty in colour. Flows vary from 15 m to over 40 m in thickness. The central parts of many flows may reach 2 mm in grain size. Pillowed flows of iron-tholeiite were not seen. Hyaloclastite forms about 0.3 m thick layers between the massive flows. It is a compact rock consisting of 0.2 to 2 cm fragments that weather rusty-brown.

In thin-section prismatic hornblende grains, often associated with dark-green actinolite, range from 0.75 to 2 mm in length and comprise approximately 45 to 65 percent of the rock. It has replaced primary clinopyroxene but still preserves some of the diallage parting of clinopyroxene. Plagioclase 0.5 to 2 mm in size, and comprising approximately 23 to 43 percent of the rock has recrystallized to a fine intergrowth of albite, epidote and calcite. The titaniferous magnetite varies from 2 to 5 percent in amount and has partially altered to leucoxene. Polycrystalline equant quartz grains, maximum about 0.2 mm in size are secondary.

Light-grey to dark-grey, fine to medium-grained calc-alkalic basaltic flows and minor flow top breccia contain rare interbedded light-grey flows interpreted to be of andesite composition, overlie tholeiitic rocks west of the junction between Cripple and Mahoney creeks. These calc-alkalic flows are in turn overlain by felsic to intermediate rocks containing iron formation.

Flows of calc-alkalic basalt and andesite vary from less than 10 m to 20 m or more in thickness. Thicker flows have coarser grain size near their centers. At places massive flows change to pillowed flows near their top. The tightly packed pillows are ellipsoidal to elongated in shape and range from 25 cm to 120 cm in length. They have 2 to 3 cm thick dark green selvages which are often more deeply weathered than the pillow interiors. The amygdules in the amygdaloidal flows and pillowed flows vary from approximately 1 to 3 mm in diameter and are filled with quartz, chlorite and calcite.

Pillow breccia with fragments up to a maximum of 35 cm in diameter occurs associated with the pillowed flows. Hyalotuffs often form the upper parts of the pillow breccia.

Homogeneous layers of tuffs are rare but tuff usually forms the matrix of monolithic lapilli tuff and pyroclastic breccia.

Dark grey thinly bedded and laminated volcanogenic metasedimentary horizons within the pyroclastic rocks probably formed by aqueous reworking of the pyroclastic rocks. These horizons vary from 5 cm to 35 cm in thickness and are traceable for 20 to 40 m along strike.

In thin section, calc-alkalic basalts and andesite are almost identical in mineralogy and texture. Plagioclase (An_{45} in andesite to An_{60} in basalt) is partially to completely altered to granular epidote, albite, quartz and chlorite. It forms about 35 to 65 percent of basalt and andesite respectively. Clinopyroxene has altered to uralite and chlorite, or has been recrystallized to hornblende and rarely actinolite. Euhedral to subhedral sphene, prismatic apatite and rare leucoxene grains occur in the groundmass intergrowth of epidote, chlorite, carbonate and quartz.

Metavolcanic rocks of mafic to intermediate composition, which are locally strongly foliated to sheared and lack any discernible primary structures are classified as amphibolite.

Amphibolite includes both fine-grained and medium-grained (1 mm in grain size) rocks. Massive rocks having a schistose texture were likely derived from massive fine-to medium-grained flows. Layered amphibolites were likely derived from tuffs of volcanogenic metasediments.

In thin section the amphibolites generally have a mineralogy of plagioclase, hornblende, quartz, biotite and leucoxene. Carbonate and epidote are often present in the layered amphibolites.

Felsic to Intermediate Metavolcanics

Felsic to intermediate metavolcanics are confined to one stratigraphic level in the map-area. They include lava flows and fragmental rocks of andesite, dacite and rhyolite composition which are intercalated with one another and with volcanogenic metasediments.

Rocks of andesitic to dacitic composition are well exposed west of Godon Lake in Denton Township and along Keefer Creek in south-central Keefer Township. They form several successive lava flows which vary in thickness from 10 to more than 60 m. Both aphanitic to porphyritic flows weather light to medium green in colour and are light grey to light grey-green on the fresh surface. Occasionally both aphanitic and porphyric flows are intercalated. The thick flows are up to 1 mm in grain size in their central parts while grain size decreases towards upper and lower contacts where 3 to 5 cm, very fine-grained dark green chilled flow margins are often present. Amygdules up to 3 mm in diameter are usually present near the top of the flows. Flow top breccia is common near the top of many flows while flow bottom breccia contains fragments of similar and different (picked up from earlier underlying flow) composition.

Pillowed lava of andesitic composition is exposed on the south shore of a small lake in the southeast corner of Keefer Township (Photo 7). The pillows are loaf-shaped, closely packed and consist of homogeneous material that weathers light-grey. They vary from 1 m to 1.5 m in length and have 1 to 4 cm thick fine-grained, dark green selvages. Pillowed lava of light grey andesite composition with up to 1 cm selvages is visible under 10 cm of water near the north shore of Crest Lake. The pillows are oval to ellipsoidal in shape and vary from 0.5 m to 1 m in maximum diameter.

Fine-grained massive lava of dacitic composition with 1 mm to 2 mm sparsly distributed phenocrysts of quartz and plagioclase occurs on the right side of Boom Lake in Keefer Township. The rock is very light grey in colour.

In thin section massive andesite flows contain 10 to 40 percent lath shaped plagioclase crystals up to 0.4 mm in size that are often altered to granular saussurite. Uralitic amphibole in amounts of 10 to 60 percent has altered to lamellar aggregates of chlorite. Equant grains of quartz and albite comprise approximately 10 to 25 percent of the rock. The ground mass contains 10 to 15 percent granular epidote and 1 to 3 percent anhedral magnetite.

The porphyritic flows contain 15 to 60 percent plagioclase phenocrysts (An_{35-45}) which show a continuous size gradation from 0.2 mm to 3 mm in length. Fibrous crystals of uralitic amphibole formed after original 0.5 to 0.75 mm pyroxene crystals comprises approximately 20 to 30 percent of the rock. Many grains have been further altered to lamellar chlorite aggregates. The ground mass consists of equant grains of albite, quartz and magnetite and rarely a few euhedral crystals of pyrite.

Porphyritic dacite is similar to porphyritic andesite in texture and contains 45 to 65 percent plagioclase phenocrysts (An_{18-26}) up to 2 mm in size. The plagioclase often displays a continuous gradation in size from the phenocrysts to the groundmass grains. Uralitic amphibole forms fibrous aggregates but mostly it has altered to lameller aggregates of chlorite which comprise 15 to 30 percent of the rock. The groundmass contains from 27 to 45 percent aggregates of albite and epidote and 10 to 15 percent equant grains of quartz, magnetite and leucoxene.

The rhyodacite has a porphyritic texture and contains two class sizes of phenocrysts. The larger (approximately 3 to 4 mm long) class size consists of phenocrysts of plagioclase (An_{14}) and polycrystalline quartz while the smaller class size consists of 0.5 mm phenocrysts of plagioclase (An_{10-12}) and orthoclase. The phenocrysts are set in a fine-grained groundmass of epidote, chlorite, carbonate and magnetite. The rock contains about 40 percent plagioclase, 20 percent orthoclase, 10 percent quartz and about 30 percent groundmass minerals. A very light brown-coloured volcanic flow of probable rhyolitic composition on the northern Thorneloe Township line is interbedded with greywacke. The flow is about 30 m thick and in thin section shows a trachytic texture consisting of 0.1 mm plagioclase phenocrysts in a very fine-grained groundmass of epidote, albite, chlorite and carbonate.

Southwest of Carlton Lake and north of Highway 101 pillow breccia occurs partially surrounded by felsic intrusive rocks. Fragments vary from 1 cm to 20 cm in size and are light grey to white on weathered surface (Photo 8). These fragments show chilled margins while the interior consists of up to 1 mm long plagioclase, hornblende and quartz grains. The matrix between the fragments is occupied by late introduced quartz and/or chlorite. Magnetite and chalcopyrite also occur locally in the matrix. The monolithic fragments do not show any size sorting or bedding.

Felsic to intermediate pyroclastic rocks are the most abundant rock type in the map-area. These rocks comprise most of the northern parts of the metavolcanic-metasedimentary sequence in Denton and Keefer Townships and southern parts of the sequence in Thorneloe Township. The rocks range in size from pyroclastic breccia to fine lithic tuff and crystal tuff. The colour of the weathered surfaces ranges from green for the intermediate rocks to light green for the felsic rocks.

Andesite and dacite tuffs form crudely to well bedded homogeneous layers 3 cm to 2 m in thickness. They also form the matrix between the rock fragments in lapilli-tuff and pyroclastic breccia. Bedded and laminated tuffs also locally contain unsorted pyroclastic fragments. Due to metamorphism most of the tuffaceous rocks show various degrees of recrystallization and original clast morphology and composition are destroyed.

The rusty-grey weathering intermediate tuffaceous rocks have an average grain size of 0.3 mm. They consist of 14 to 40 percent epidote and clinozoisite, 10 to 35 percent lamellar chlorite, 15 to 35 percent quartz and 4 to 25 percent carbonate. In places variable amounts of actinolite, plagioclase and sericite also occur in these rocks. On the average they contain about 1 percent magnetite and/or leucoxene.

Crystal tuff, located approximately 0.5 km northeast of Boom

Lake in Keefer Township, contains fine-grained plagioclase and quartz. The rock has a crudely developed bedding and is schistose. Plagioclase and quartz crystals and broken crystals show a complete gradation in size from 1 mm to 0.1 mm. Streaks consisting of chlorite + biotite and magnetite are lithic clasts which have been flattened parallel to foliation. Plagioclase and quartz show recrystallization effects at grain margins. The rock has a white to chalky weathered surface. It consists of 34 percent plagioclase, 45 percent quartz, 20 percent chlorite plus biotite and trace amounts of magnetite and epidote.

Crystal tuff is present along most of the north contact of the supracrustals with the felsic intrusive rocks. The crystal tuff weathers light grey and contains 0.5 mm to 1 mm unsorted plagioclase and quartz crystals and broken crystals in a very fine-grained (0.05 mm to 0.01 mm) matrix of chlorite, muscovite and magnetite. The rock consists of 48 to 77 percent plagioclase, 10 to 35 percent quartz, 10 to 15 percent chlorite and/or muscovite and 2 to 3 percent magnetite. The rock often shows a poorly developed bedding.

Lapilli-tuff and pyroclastic breccia are exposed between Cripple Creek and Highway 101 in the northwest quarter of Denton Township. They are composed of dacite to andesite fragments in a fine-grained tuff matrix of similar composition. The 1 to 10 cm volcanic fragments form 10 to 40 percent of the rock, and are light-grey to light-green in colour in contrast to the darker, fine-grained strongly weathered matrix.

The felsic to intermediate pyroclastic rocks form an assemblage of agglomerate, lapilli tuff and tuff breccia that is interlayered with a fine dark grey to grey banded tuff sequence. The angular clasts are generally of uniform size and composition within an individual bed which may be from 10 cm to 1 m thick. Size and compositional variations are, however, also present. The clasts are often flattened with an axial ratio of 3:1 or more and are set in a tuffaceous matrix of lighter colour which is similar to the interbedded tuff bands.

The tuff bands vary from 30 cm to 5 m in total thickness which in turn consist of 2 mm to 1.5 cm thick laminae having varying shades of green, brown and black. The colour is a reflection of the mineralogy of each individual laminae. In thin section the laminae consist of an assemblage of plagioclase + quartz ± chlorite ± muscovite ± biotite ± epidote and clinozoisite ± garnet ± hornblende ± diopside depending upon the original composition of the rock and distance from the contact with the felsic intrusive rocks (Photo 9). The laminae containing plagioclase, quartz and chlorite occur away from the contact while laminae containing plagioclase, hornblende, diopside and quartz occur in contact with the intrusions.

The above described pyroclastic rocks grade along strike into and are stratigraphically overlain by clastic metasediments derived from erosion of the felsic to intermediate metavolcanic rocks.

A thickly bedded matrix supported volcanogenic conglomerate with subangular to subrounded, monolithic clasts of andesite composition occurs south of the hydro line, about 100 m east of the gravel road, leading to the garbage dump in Denton Township. The clasts vary from 1 to 10 cm in diameter with their long dimensions oriented parallel to bedding (Photo 10). The matrix is a buff weathering, fine-grained (0.1 mm) volcanogenic arkose. The rock was probably derived by erosion of andesite lapilli tuff and tuff breccia. It grades upwards into fine-grained, thinly to medium-bedded, buff-weathering volcanogenic arkose.

In thin section the volcanogenic arkose consists of approximately 55 percent quartz, 25 percent feldspar, 15 percent muscovite with minor amounts of chlorite, epidote and magnetite (Photo 11). Epidote porphyroblasts that developed by recrystallization of feldspar enclose minute quartz grains.

Medium to thickly-bedded tuffaceous wacke occurs approximately 0.5 km north of Godon Lake at approximately the same stratigraphic level as the above volcanogenic conglomerate/ arkose. In thin section it consists of 0.1 mm equant grains of quartz and plagioclase set in a matrix of very fine-grained epidote, biotite, chlorite and magnetite. Pink garnet porphyroblasts about 1 mm in diameter enclose abundant biotite and quartz inclusions.

Lapilli tuff and tuff breccia on the hydro line approximately 1 km east of Boom Lake in Keefer Township, is succeeded upwards by thickly bedded, fine-grained sandstone which contains up to 5 mm long quartz pebbles. To the west on the other side of the diabase dike, this pebbly sandstone grades into thickly bedded, very fine-grained sandstone which displays cross-bedding and contain 6 cm to 15 cm thick cherty layers.

Fine-grained arenite occurs on the hydro line, approximately 1 km east of Opishing Lake in Keefer Township. The rock is thinly bedded and weathers light pale grey to buff. In thin section it consists of about 85 percent equant grains of quartz set in a matrix of biotite, chlorite, epidote and magnetite. Subhedral 0.5 mm long, platy muscovite porphyroblasts enclose minute quartz grains. Epidote, chlorite and magnetite occur in 4 mm long streaks which probably represent flattened lithic clasts.

Felsic to intermediate pyroclastic rocks grade into laminated to subfissile interbedded tuffaceous wacke, calcareous argillite and arkose and subarkose to the west in Keefer Township. The outcrop on Highway 101 south of Keefer Creek and south of Crest Lake consists of thin to medium-bedded calcareous metasediments which have been metamorphosed to the hornblende hornfels facies rank. The metasediments consist of interbedded light brown arkose, subarkose, recrystallized chert containing sulphide ironstone, and dark grey and black amphibolite beds. In thin section arkose and subarkose consist of equant quartz and plagioclase grains in a matrix of minor biotite, muscovite, epidote and chlorite. Amphibolite consists of prismatic hornblende, platy biotite and equant grains of quartz and plagioclase set in a matrix of chlorite and magnetite. The subparallel alignment of hornblende and biotite imparts a strong foliation to the rock that parallels the bedding.

PETROCHEMISTRY OF METAVOLCANICS

Selected rock specimens, collected during the course of field mapping, were analyzed by the Geoscience Laboratories, Ontario Geological Survey. The analyzed samples, wherever outcrops permitted, were collected to give a representative cross-section of the supracrustal belt. Results of chemical analyses are plotted on a Jensen Cation Plot (Jensen, 1976; Figure 1) to assign the rocks to their respective chemical rock suites. During data processing, most of the rocks classified as calc-alkaline basalts in the field (Analyses 29, 30, 31, 32, 33, & 34 Table 2) showed an alkaline chemical affinity according to the nepheline-olivine-quartz plot. However, when plotted on a $Na_2O + K_2O$ vs. S_1O_2 plot (Irvine and Baragar, 1971, Figure 2), these rocks occupy the subalkaline field. Thus the original classification is retained. Probably these rocks were altered during their deposition and/or later enriched in alkalies during the alteration of the overlying intermediate and felsic metavolcanics.

The Jensen Cation plot indicates that ultramafic metavolcanic rocks in the map-area are dominantly peridotitic komatiite with lesser pyroxenite komatiite and basaltic komatiite. These rocks show a steady increase in Fe/Mg ratios as the compositions move steadily away from the MgO apex, towards the Al_2O_3 apex (Figure 1). In mineralogy this change is clearly observed in these rocks by a decrease in modal olivine and relative increase in pyroxene and pyroxene + plagioclase in the pyroxenite komatiite and basaltic komatiite respectively. Ultramafic rocks show high contents of Ni, Cr, Pd and Pt, with values ranging from 800-2800 ppm Ni, 1000-2500 ppm Cr, 2-19 ppm Pd and 3-26 ppm Pt (analyses 1 to 9, table 2).

In tholeitic rocks, which surround the ultramafic metavolcanics, both Mg-tholeites and Fe-tholeites are equally abundant though rocks with intermediate and felsic compositions are less common (Analyses 10 to 28, table A). On the Jensen Cation Plot a considerable continuum between Mg-tholeites and Fe-tholeites is evident which explains the difficulty encountered in distinguishing them in the field. The rocks of tholeitic composition show a relative increase in TiO_2 with the increase in Fe/Mg ratio. Mg-tholeitic rocks plotting near the ultramafic rocks show high values of Pd and Pt (about 10 to 13 ppm; analyses 14, 16 and 18, table 2).

In the calcalkaline suite, rocks of intermediate to felsic compositions predominate over basaltic rocks. These rocks show a marked increase in Al_2O_3 and alkalies compared to rocks of the tholeitic suite. This is reflected by the marked abundances of plagioclase in these rocks.

Metasediments

Chemical Metasediments

Iron-rich chemical metasediments and associated volcanogenic metasediments occur interbedded with the felsic to intermediate pyroclastic rocks. Their presence appears to be restricted to parts of the upper 200 m thick stratigraphic interval of the felsic to intermediate pyroclastic rocks. Serpentinized peridotitic komatiite often occurs interbedded with the ironstone at this stratigraphic level and together they probably mark the start of another volcanic cycle which, however, has not developed in the map-area. Pyke (1980, P. 71, 72) has reported that iron formation confined to the upper formation of the Deloro Group, occurs as a persistent stratigraphic unit in the Timmins area.

Exposure of ironstone in the map-area is very low. The distribution and trend of the ironstone was delineated with the help of magnetic maps and drill hole information from the assessment work files. Some of the iron-rich units classified as iron formation in the field were found to contain less than 10 percent iron and are reclassified as ferruginous metasediments.

The only outcrops of iron formation found in the area are: 1) sulphidic ironstone on Highway 101 south of Keefer Creek, and 2) oxide banded ironstone south of a small lake in southeast Keefer Township. The sulphide-facies iron formation on Highway 101 consists of a 6 m thick white to light brown chert that weathers rusty brown. Sulphides, mostly pyrite together with some pyrrhotite, form 0.5 to 2 cm wide layers within the chert. Rare grains of chalcopyrite and galena are often present with the other sulphides. Grain size varies from very fine, about 0.5 mm where the sulphides occur disseminated in the chert, to coarse in the sulphide-rich layers. Calcareous argillite now metamorphosed to amphibolite forms thin layers within the chert. On the average, sulphide minerals comprise less than 5 percent of the iron Formation.

The banded ironstone in southeast Keefer Township consists of about 0.5 cm to 2 cm thick layers of fine-grained magnetite and chert. The magnetite layers contain granular steel-grey magnetite and minor chert and are in sharp contact with the chert layers.

Chert layers contain less than 5 percent magnetite, and vary in colour from white to black. Thick chert layers are laminated to thinly laminated with the laminae being distinguishable by slight colour variations. The thick chert layers rarely contain 2 cm to 3 cm thick black argillite layers, now amphibolite. Sulphide minerals, mainly pyrite and pyrrhotite with trace amounts of chalcopyrite, occur both in the chert-magnetite and the chert layers as disseminated grains and fracture fillings. Pyrite characteristically occurs in the black argillite now amphibolite having been metamorphosed to hornblende hornfels facies rank. One trenched exposure, on the right side of the main outcrop, exposes a unit consisting of medium-grained, steel grey magnetite and green epidote that has been contact metamorphosed due to intrusion of a small pod of medium-grained diorite near the north end of the trench. Minor disseminated chalcopyrite occurs both in the epidote-and magnetite-rich domains. A dip needle survey around the ironstone outcrops (Ginn, R.M. 1959; Assessment File F670) indicated that the iron-rich strata have a maximum surface width of about 20 m. The ironstone dips 75 degrees to the north and in places is completely missing.

The drill hole data (Assessment Files T 335 and T556) indicates that sulphidic ironstone is present in Denton Township. It consists of pyrite and pyrrhotite and is interbedded with peridotitic komatiite, and with volcanogenic metasediments consisting of eroded detritus of the felsic to intermediate pyroclastic rocks. Most of the ironstone in eastern Thorneloe Township is sulphidic ironstone (Assessment File

T-675). It is interbedded with amphibolite of andesitic composition. Spheroidal concentrations of pyrite, reported by Pyke (1980, p. 73) from Langmuir Township are also reported in drill hole data from Denton and Thorneloe Townships (see list of Properties, this report).

Banded ironstone east of Highway 144 in Thorneloe Township (Drillhole data, assessment files T. 397 and T. 538) attains its maximum thickness probably due to repitition by folding. Thin alternating layers of chert, and magnetite with minor chalcopyrite forms the bulk of the ironstone which contains minor interbedded peridotitic komatiite layers. To the east the banded ironstone changes from oxide ironstone to sulphidic ironstone. The ironstone occurs as detached lenses enclosed in ferruginous metasediments. Taking into account the geological, magnetic and drillhole data it would appear that there are no substantial economic amounts of ironstone in the map area.

Clastic Metasediments

Clastic metasediments in the map area occupy the northern third of Thorneloe Township and extend southwest into Denton Township. They have a wedge-shaped configuration and overlie felsic to intermediate pyroclastic and metavolcanic rocks. Exposure of metasediments within the map area is low. The clastic metasediments appear to have been deposited in two associations: 1) conglomerate - wacke association 2) wacke-siltstone association

Conglomerate-Wacke Association

Conglomerate and wacke outcrop at Wawaitin Dam and further to the west on the right side of the Tatachikapika River in Thorneloe Township. Harding and Berry (1939, p. 9) reported the presence of an outcrop in the vicinity of Cripple Creek which the author could not locate in the field. However, the author did find a few 50 cm by 1 m angular fragments of conglomerate in the bed of Cripple Creek about 800 m northeast of its junction with Mahoney Creek. The best exposure along the Mattagami River immediately north of Wawaitin Dam consists of about 100 m of interbedded polymictic pebble to boulder conglomerate and greywacke. The contact with the underlying felsic to intermediate rocks was not observed in the map-area.

The conglomerate is light grey to green-grey in colour on fresh surfaces and weathers to light green-grey, with light brown and green-grey clasts. The beds are usually in excess of 1 m thick though rarely beds consisting of a single layer of pebbles occur. Clasts of granitoid rock, quartz diorite, felsic metavolcanic, mafic metavolcanic, chert, oxide facies iron formation, and quartz are present. Light coloured clasts of granitoid rock, chert, quartz and felsic volcanic are more prominent due to their colour contrast with the matrix and their resistance to weathering (Photo 12). The granitoid clasts are larger in size, maximum 20 cm, and show better sphericity than do the felsic metavolcanic, chert and quartz clasts which tend to be pebble size and angular to subrounded.

The conglomerate shows a strong foliation parallel to bedding. The clasts show length to width ratios usually in the range of 2:1 to 5:1 though clasts with ratios of 7:1 are not uncommon. The clasts of felsic metavolcanic rocks are more elongated than the granitic clasts.

Mafic to intermediate metavolcanic clasts commonly have length to width ratios in the range of 7:1 to more than 10:1. Due to the similarity of colour they are difficult to discern from the matrix. The clasts constitute less than half of the rock and are matrix-supported. The matrix consists of fine-to medium-grained blue-grey to green-grey wacke consisting of angular quartz and feldspar set in an interstitial intergrowth of carbonate, chlorite and sericite.

Wacke-Siltstone Association

An interbedded sequence of wacke and siltstone occurs further north of the conglomerate-wacke association along the Mattagami River. The change from conglomerate-wacke to wacke-siltstone upsection is abrupt. The maximum exposed thickness of the wacke-siltstone along the river is about 400 m. Individual beds vary from 2 cm to 2 m in thickness, with the siltstone beds rarely exceeding 15 cm. Two or more wacke beds or two or more siltstone beds can occur side by side. Bedding planes are very sharp and are only interrupted by sedimentary structures such as flute casts and slump structures. Grading in individual beds from wacke at the base to siltstone at the top is some times present and indicates the beds face north. Partial Bouma sequences, typical of sediments deposited by turbidity currents (Walker 1976) consisting of ABE, BE and AB divisions, were also observed in a few outcrops near Wawaitin Falls. A weakly developed cross bedding was also observed in these sediments.

The wacke varies from light green to dark grey in colour on weathered surfaces. The outcrops east and west of Cripple Creek are light-grey and contain variable amounts of carbonate. A thinly bedded outcrop east of Wawaitin Falls consists of light brown wacke beds containing carbonate and fuchsite and dark grey siltstone layers consisting of tuffaceous material. A small outcrop on the northern township line of Thorneloe Township, about 1.4 km east of Highway 101, consists of alternating 1 cm thick layers of grey tuffaceous wacke and dark-grey siltstone.

In thin section the wacke consists of 10 to 15 percent quartz, 15 to 20 percent feldspar grains, and 45 to 50 percent lithic clasts set in a fine-grained matrix of sericite, chlorite, epidote, carbonate and magnetite. The subangular to subrounded crystal fragments of quartz and feldspar are about 0.5 mm in size. Crystal fragments of plagioclase (An_{36}) and orthoclase are approximately equally abundant. Quartz grains show a partial internal recrystallization to finer grain size. Plagioclase is partially sericitized. Orthoclase grains show recrystallization to finer grain size on the margins. Chert clasts are the only recognizable primary lithic fragments. Other lithic fragments have been altered to a mineral assemblage of epidote, chlorite, carbonate and albite that is compatible with them being volcanic, likely intermediate to mafic detritus.

The siltstone consists of about 50-80 percent angular grains of quartz (0.02 mm) set in an extremely fine-grained matrix of chlorite, carbonate, sericite and opaques.

The wacke and siltstone have been locally metamorphosed to phyllite, slate, and quartz-feldspar-chlorite-sericite schist. These rocks show moderately well developed cleavage oriented at a high angle to the bedding. In thin section their mineralogy is similar to siltstone but alignment of chlorite and sericite flakes gives the rock a strong foliation. The quartz-feldspar-chlorite-sericite schist show a considerable increase in grain size in comparison to siltstone. A schistose structure is developed due to alignment of phyllosilicates and streaks of quartz-feldspathic material.

Near an island in the Mattagami River, about 1.2 km north of the dam, thick beds of arkosic wacke alternate with thin beds of wacke. The thin beds can be further subdivided into 10 cm to 15 cm thick wacke and 5 cm to 10 cm thick siltstone layers. The thick beds of arkosic wacke are 0.75 m to 1.5 m thick and often contain 3 cm to 5 cm thick siltstone layers at regular intervals of 20 to 30 cm. The arkosic wackes shows grain-gradation which indicate they face south and are overturned. Contacts between siltstone and wacke layers are mostly sharp but gradations also occur at a few places.

In thin section the arkosic wacke consists of 35 to 55 percent quartz, 10 to 25 percent feldspar and 35 to 40 percent lithic clasts in a fine-grained matrix of quartz, feldspar, chlorite, sericite and hematite. The subangular to subrounded lithic clasts commonly vary from 0.5 mm to 3 mm in size. They show alteration to epidote, chlorite, sericite but clast boundaries are still preserved.

In thin section siltstone consists of 35 to 45 percent intergrowths of chlorite and sericite enclosing 0.01 mm, angular to subangular, quartz clasts. Leucoxene is also enclosed along with quartz. Anhedral authigenic carbonate is sparsely distributed.

Metamorphosed Mafic and Intermediate Intrusions

Metamorphosed rocks of gabbro, diorite and quartz diorite composition intrude the metavolcanic-metasedimentary sequence at several localities within the map-area. Based on their dimensions and composition these rocks can be subdivided into: 1) metamorphosed gabbro and diorite sills and small lenticular intrusions and 2) one stock of quartz diorite, herein named the Quartz Diorite Stock.

Gabbro and Diorite

In Keefer Township two gabbroic bodies that have a maximum area of 100 by 400 m intrude porphyritic andesite east of Boom Lake and intermediate tuffaceous rocks northeast of Keefer Lake respectively. Rocks of similar composition also intrude intermediate to felsic metavolcanics about 800 m southeast of Denton Lake and mafic metavolcanics in the northeast corner of Thorneloe Township.

On the weathered surface the gabbro is dark green in colour with the black ferromagnesian minerals standing out on the surface. The rock, 1 mm to 2 mm in grain size, is strongly foliated and in places has been sheared.

In thin section recrystallized plagioclase (An_{35}) forms about 2 mm poikiloblasts as well as small interstitial grains. Relict augite occurs as scattered remnants in the cores of large shreds of actinolite aggregates and/or hornblende crystals. Chlorite has developed by further alteration of amphiboles. Quartz forms small grains interstitial to the other minerals. Titanferous magnetite partially altered to leucoxene, sphene and apatite occur as accessory minerals.

Small lenticular intrusions of diorite occur in felsic to intermediate pyroclastic rocks about 400 m north of Warren Lake in Keefer Township and about 0.5 km north of the junction of Lostdog and Godon Creeks in Denton Township. At both places the diorite intrusions contain inclusions of host rock and appear to truncate the trend and bedding of their host rocks.

The diorite is medium-grained and dark grey in colour on both fresh and weathered surfaces. At both places it is strongly foliated to sheared with the foliation and schistosity parallel to that of their host rocks.

In thin section the rock shows a strong alteration of the original mineralogy. Plagioclase, greater than 2 mm in size that makes up about 30 to 55 percent of rock, is now saussuritized though some of it has recrystallized to 0.01 mm grains of oligoclase composition. The saussurite consists of approximately 0.01 mm grains of epidote, carbonate and sericite. Prismatic hornblende and shreds of uralite both occur in clusters enclosing clinopyroxene remnants. Together the amphiboles make up approximately 40 to 65 percent of the rock. Quartz, about 1 to 4 percent, forms 0.1 mm grains interstitial to the other minerals. Sphene, apatite and titaniferous magnetite now partially altered to leucoxene occur as accessory minerals together with the quartz. Chemical analyses (analyses 42 & 43) of mafic intrusive rocks are given in table 2).

Quartz Diorite Stock

A roughly lenticular stock of quartz diorite is located in the centre of Keefer Township. It covers about 6 km^2 near the northern boundary of the supracrustal rocks which it intrudes. At the contact, bedding in the felsic to intermediate pyroclastic rocks has been strongly contorted. The development of volcanic tectonic breccia and abundant metavolcanic inclusions of various types of volcanic rocks in the quartz diorite are indicative of a forceful mode of intrusion. Quartzofeldspathic and pegmatitic veins which contain plagioclase, k-feldspar and quartz and vary in width from 0.5 cm to 15 cm, intrude the quartz diorite and supracrustal rocks.

The quartz diorite has a hypidiomorphic granular texture. It contains euhedral to subhedral tubular plagioclase (An_{31-38}) crystals with maximum dimensions of 2 by 4 mm. A few grains show a patchy development of normal zoning of An_{40} to An_{30}. Saussuritization is common in the more calcic zones. Hornblende forms prismatic crystals which are of the same size as the plagioclase. It has quartz inclusions and has alterated to chlorite and epidote. Biotite forms agregates and occasionally includes anhedral magnetite. Anhedral quartz forms polycrystalline aggregates and occurs interstitially together with sphene, prismatic apatite and subhedral magnetite between the plagioclase and hornblende crystals.

The quartz diorite has not been as strongly metamorphosed as the gabbro and diorite but does show effects of recrystallization. It is probably a later intrusion than the gabbro and diorite.

Intermediate to Felsic Intrusive Rocks

The intermediate to felsic intrusive rocks in the area form three distinct plutons. They are:

1. Quartz diorite, tonalite and quartz monzodiorite which occupy Keefer Township, northwestern Denton Township and the area northwest and west of Lostdog Creek in Denton Township. Slightly more potassic rocks have been reported from Sewell Township southwest of Keefer Township by Milne (1972; p. 47).
2. Porphyritic Granodiorite occupies a small area on and south of Lostdog Creek in Denton Township.
3. Leucocratic granodiorite occupies southeastern Denton Township and the entire southern part of Thorneloe Township.

Age relationships are well established by the outcrops on Lostdog Creek southeast of Godon Lake. There, porphyritic granodiorite intrudes quartz monzodiorite. About 500 m further south the leucocratic granodiorite contains abundant roof pendants of porphyritic granodiorite. This establishes the quartz diorite, tonalite, quartz monzodiorite suite as the oldest and leucocratic granodiorite as the youngest intrusive phases of the intermediate to felsic intrusive rocks.

Aldrich and Wetherill (1960, p. 339) determined the radiometric age of a sample from the quartz diorite, tonalite and quartz monzodiorite suite. The sample was taken from an outcrop on Highway 101, about 600 m west of the Star Lake road, in Keefer Township. The isotopic age by the rubidium-strontium method is 2510 Ma (error estimate not given) and 2390 Ma by the potassium-argon method.

The relative ages of emplacement of the intrusive rocks in the area indicate, as it has been established elsewhere in Early Precambrian areas that the earliest intrusive rocks are more sodic and the later intrusive rocks are more potassic.

Quartz Diorite, Quartz Monzodiorite and Tonalite

Quartz diorite, quartz monzodiorite and tonalite are commonly pink to grey on fresh surfaces and white, pale grey or pale pink on weathered surfaces. These rocks are well jointed and foliated and occasionally gneissic (gneissosity symbol not used on map-face). The medium-grained rocks, maximum 2 by 4 mm in grain size, have microporphyritic granular to hypidiomorphic granular textures. The constituent minerals have similar habits in all the rock types belonging to this suite. It is the modal variation of these minerals which led to the subdivision of this suite into these rock types. Table 3 lists the modal mineralogy of the rock types of this suite. They are plotted in Figure 3 following Streckeisen (1976).

In thin section plagioclase (An_{36} in quartz diorite to An_{20} in quartz monzodiorite) forms euhedral to subhedral tabular, normally zoned (about An_{10}) crystals. Alteration to saussurite has occurred in minute patches within the crystals. Hornblende, when present, forms prismatic crystals usually comparable in size to the plagioclase. Alteration of the hornblende to chlorite and epidote has occurred along crystal margins. Both microcline and quartz form anhedral grains approximately 1 mm in maximum size and occur interstitially, together with euhedral sphene, prismatic apatite, euhedral epidote, chlorite, biotite and magnetite.

Porphyritic Granodiorite

Porphyritic granodiorite forms a few outcrops along and south of Lostdog Creek, southeast of Godon Lake, in Denton Township. In the east and west it is separated by faults from the leucocratic granodiorite and quartz diorite, tonalite and quartz monzodiorite suite. Near a small lake, in the southwest corner of Thorneloe Township it occurs as roof pendants in the leucocratic granodiorite. The rock was not observed further to the east in Thorneloe Township.

The porphyritic granodiorite is a medium to coarse-grained foliated to massive rock, which is grey-white to pink in colour on both fresh and weathered surfaces. It contains abundant (10-15 percent), randomly oriented phenocrysts of potassium feldspar which vary in size from 4 mm to 3 cm. Near faults the rock is often sheared and consists of broken phenocrysts or augens in a crushed matrix.

In thin section the rock has a microporphyritic granular to hypidiomorphic granular texture and consists of 59-64 percent plagioclase, 9 to 15 percent microcline, 17 to 20 percent quartz, 3 to 5 percent hornblende and minor amounts of biotite, epidote and chlorite. Sphene and apatite are accessory minerals.

The plagioclase (An_{14-18}) forms up to 2 mm long tabular crystals and is rarely oscillatory zoned. It has altered to saussurite with the more calcic zones in the zoned crystals more extensively altered. The microcline forms phenocrysts and also occurs in small anhedral interstitial grains. The microcline phenocrysts contain euhedral 0.1 to 0.3 mm long inclusions of zoned plagioclase, hornblende, sphene and apatite. The interstitial microcline does not enclose any inclusions.

Yellow-green to blue-green pleochroic hornblende forms prismatic crystals and encloses abundant sphene and apatite inclusions. Biotite appears to have developed by the alteration of hornblende. Chlorite is an alteration product of both hornblende and biotite. Epidote (clinozoisite) forms 0.5 mm long euhedral to anhedral crystals. Most of it appears to be of secondary origin but the possibility some is primary cannot be ruled out. Anhedral aggregates of polycrystalline quartz are similar to plagioclase in size. They occur interstitially together with microcline, euhedral sphene and apatite. Myrmekitic growths have a maximum size of 0.2 by 0.5 mm between grains.

The porphyritic granodiorite is similar in most respects to the Adams Granodiorite exposed in Adams and Eldorado Townships (Pyke, 1975) and large parts of the adjoining townships of Price, McArthur, and Douglas (Pyke, Ayres and James 1973).

Leucocratic Granodiorite

Leucocratic granodiorite underlies the southeastern part of Denton Township and the entire southern part of Thorneloe Township. The rock is medium-grained and is grey to pink in colour on both weathered and fresh surfaces. It is massive to foliated and forms small rounded low lying outcrops, mostly in swampy areas.

In thin section the rock has a hypidiomorphic granular texture and consists of 53 to 58 percent plagioclase, 15 to 18 percent microcline, about 28 percent quartz and minor amounts of muscovite, biotite, chlorite and epidote. Apatite, sphene and magnetite are accessory minerals.

Plagioclase (An_{12}) forms tabular to anhedral crystals which vary from 0.5 to 1.5 mm in size. Oscillatory zoning with more calcic zones altered to saussurite is common. Microcline forms, up to 0.5 mm in diameter, anhedral crystals and together occurs interstitially to the plagioclase crystals with anhedral polycrystalline quartz aggregates which vary in size from 0.5 mm to 0.1 mm . Muscovite, biotite and chlorite all less than 0.1 mm in length, form individual plates and together with euhedral to subhedral sphene and anhedral magnetite and clinozoisite occupy the interstitial positions between the plagioclase, microcline and quartz.

Quartz-Feldspar Porphyries

The quartz-feldspar porphyries occur west of the dam on the Mattagami River in Thorneloe Township, and west of Mahoney Lake in Denton Township.

The quartz-feldspar porphyry west of the dam is entirely covered by glacial deposits. Drillhole data (assessment files T-82 and T-1631) indicate that it covers an area of 1400 by 400 m with its longer dimension oriented roughly parallel to the regional foliation of the supracrustal rocks. The porphyry appears to have been emplaced along the metavolcanic-metasedimentary contact. It is pink to grey in colour and contains crystals of plagioclase and quartz.

The quartz-feldspar porphyry west of Mahoney Creek is a roughly northwest-trending dike, approximately 300 m in length and 50 m in width, which has intruded the quartz diorite to tonalite. It is a light-grey, fine-grained rock which contains approximately 2 to 4 mm long quartz and albite crystals set in a ground mass of saussuritized plagioclase, microcline, quartz, chlorite with accessory apatite, magnetite, sericite, carbonate and secondary epidote.

MIDDLE AND LATE PRECAMBRIAN

Diabase Dikes

Quartz diabase dike swarms intrude all the other previously described rocks. They occasionally contain up to 4 cm in diameter glomeroporphyritic plagioclase aggregates and variable amounts of magnetite up to a maximum 20 percent. Olivine diabase reported by Harding and Berry (1939) in northeast Keefer Township and central Denton Township were found by the author to be respectively quartz diabase and gabbro.

The quartz diabase dikes have variable widths. They dip vertically to steeply east. They all show chilled margins 10 cm to 1 m thick. Towards the center of the dike they become coarse-grained. Chilled apophyses of diabase occur in the host rocks. Occasionally these apophyses are so abundunt that an agmatite breccia is formed. The dikes strike north to approximately N40°

W. The most common strikes are, N5° W, N10° W and N30° W. Isotopic age studies (K-Ar method) by Leech (1965, in Ferguson 1968) on samples collected from diabase dikes in Keefer, Bristol and surrounding Townships indicate that there are at least two periods of diabase intrusions at 1100-1200 Ma and 1800-2000 Ma respectively. The K-Ar whole rocks dates for a N5°W trending dike in Keefer Township is 1930 Ma. Two dikes from Bristol Township striking N35°W and N20°W give dates of 1760 Ma and 1325 Ma respectively. These dates suggest that most of the quartz diabase dikes in the map area of Middle Precambrian age.

The quartz diabase is dark grey on the fresh surface and weathers grey to dark grey or brown.

In thin section the quartz diabase is predominantly subophitic textured, though occasionally pyroxene poikilitically encloses the plagioclase laths. Tt consists of 45 to 55 percent plagioclase, 10 to 30 percent clinopyroxene, 0-20 percent hornblende, 1 to 10 percent quartz, 2 to 6 percent magnetite and minor amounts of biotite, chlorite and epidote. Accessory apatite is ubiquitous.

The plagioclase forms lath-shaped to tabular crystals and has a labradorite composition. Rare normal to oscillatory zoning is present in a few grains. The plagioclase show various degrees of alteration to saussurite. Clinopyroxene, probably augite forms stumpy crystals which have altered to hornblende and biotite along the grain margins. In places clinopyroxene grains have been entirely replaced by uralite with the release of secondary magnetite. Subhedral to anhedral grains of titaniferous magnetite together with anhedral quartz and prismatic apatite occur interstitially between plagioclase and pyroxene. The titaniferous magnetite often has been partially altered to leucoxene near the grain margins. Chemical analysis of one thin fine grained diabase dike (analysis 44) is given in table A.

CENOZOIC

Quaternary

Pleistocene and Recent

The map-area is covered by varying thickness of glacial deposits. The advance of the Wisconsin ice-sheet deposited a sandy boulder till. Until the general retreat of the ice-sheet began about the end of Wisconsinan time no fluctuations of the ice-sheet are known to have occurred in the area. The strike of glacial striae in the felsic metavolcanics south of Denton lake have a bearing of 186°.

Small deposits of glacial till consisting of light grey sandy cobble and boulder till overlies the Precambrian bedrock on Highway 101, in the vicinity of Lostdog Creek and Godon Lake in Denton Township. Esker complexes (not shown on map-face) forming prominent ridges of sand and gravel extend from north of Star Lake south across Keefer Lake in Keefer Township. Tan brown silt and varved clays overlain by sandy till is exposed along the Tatachikapika River and covers most of Thorneloe Township. These deposits were laid down in Lake Barlow-Ojibway (Boissonneau 1965).

Recent deposits consist mainly of peat and organic material in the swamps and muskegs, and some detrital material deposited in the stream channels. Calcareous material or marl is said to occur at the bottom of Pup Lakes in Thorneloe Township (Ferguson, 1956, Assessment File T. 618).

Stratigraphy

In the metavolcanic rocks top directions were determined from flow top breccia, pillow facings and shape and position of vesicules and amygdules in the flow. The facing directions from grain gradation and cross-bedding in the metasedimentary rocks together with the distribution of the ironstone, considered to be a marker horizon, were used to establish the structure and stratigraphy of the area.

The ultramafic to mafic rocks which occur southwest of the junction of Mahoney and Cripple Creeks, on Mahoney Creek and northeast of Godon Lake in Denton Township are interpreted to be the oldest supracrustal sequence in the map-area. The base of this sequence was not observed. The maximum thickness of ultramafic to mafic metavolcanics appears to be less than 400 m. The presence of pillow flows indicate that some of these flows were extruded underwater. Pillows are most abundantly developed in rocks of basaltic komatiite composition. The presence of thick lense of very fine-grained quartzite interbedded with the ultramafic metavolcanics, located southwest of the junction of Cripple and Mahoney Creeks may be suggestive of a prolonged quiet periods of sedimentation below wave base between periods of volcanism.

The ultramafic to mafic rocks appear to be unconformably overlain by a sequence of mafic and mafic to intermediate metavolcanics. The strike of bedding of the two sequences varies by 30° to 45° indicating that the ultramafic rocks were probably tilted before deposition of the overlying sequence. The maximum thickness of mafic metavolcanics overlying ultramafic rocks, as observed west of the junction of Cripple and Mahoney Creeks, is probably less than 800 m. For the most part this basaltic sequence consists of thin to thick massive flows at the base capped by pillowed flows at the top. The pillows and hyaloclastite layers indicate they were deposited subaqueously.

Near the top of the metavolcanic sequence rocks of intermediate composition predominate and are interlayered with felsic metavolcanic rocks. In the intermediate metavolcanic rocks pillowed flows are rare. Thick aphanitic and porphyritic flows are the predominant flow type. Minor thin beds of metasediments occur between the flows. The upper parts of this sequence could possibly have been extruded subaerially. Overlying felsic pyroclastics of rhyodacite and rhyolite composition likely initially formed during explosive volcanism. They were deposited on the mafic to intermediate or ultramafic to mafic sequences. The presence of metasediments that are complexly interbedded with coarse breccia as well as with the fine-grained tuff indicate that sedimentation was synchronous with volcanism. Thin flows of peridotitic komatiite and ironstone occur interbedded with the felsic tuff and metasedimentary rocks near the top of this intermediate to felsic metavolcanic sequence. The maximum thickness of this sequence appears to be less than 1000 m.

Deposition of metasediments continued in the northeastern part of the area and ultimately covered most of the metavolcanic sequence in the western part of the area. Most of the conglomerate, wacke and siltstone are spatially associated with and were likely in part derived from the volcanic terrane. The presence of granitic boulders in the conglomerate indicate a plutonic provenance though a specific source could not be determined.

The author interprets the metavolcanic sequence to be correlative to the Deloro Group (Pyke, 1974) or Lower Supergroup (Pyke and Jensen, 1976). Ultramafic volcanic rocks are known to occur at the base of the Deloro Group in the Peterlong Lake area (Pyke 1978). Mafic to intermediate rocks of basaltic and basaltic andesite composition which form the main central part of the Deloro Group are well exposed in Deloro Township (Pyke, 1980). The top of the Deloro Group is pyroclastic rocks dominantly of felsic composition, and iron formation intercalated with minor tuff which is well exposed in Shaw, Carmen and Deloro Townships (Pyke, 1980). Flows of peridotitic and basaltic komatiite composition conformably overlie this iron formation in Shaw Township (Pyke 1980), and represent the start of another volcanic cycle. Metasedimentary rocks in Denton and Thorneloe Townships most probably are equivalent to the Dome and Beatty formations of the Porcupine Group (Pyke 1980) which are, in part, the time equivalents of the metavolcanic rocks of the Tisdale Group.

Metamorphism

The volcanic and sedimentary rocks were regionally metamorphosed to the low greenschist facies rank. They are characterized by quartz-albite-epidote mineral assemblages in the centre of the belt, to well foliated greenschist facies rank-quartz-hornblende-epidote mineral assemblages near the contact with the felsic intrusive rocks. Contact metamorphic aureoles, up to 500 m in width have been superimposed on the regionally metamorphosed terrane around the intrabelt felsic intrusions. These aureoles contain albite-epidote hornfels to amphibole-epidote hornfels mineral assemblages.

Structural Geology

The southwest to east-west trending metavolcanic-metasedimentary sequence of the area is part of the Abitibi Subprovince of the Superior Province. Lack of outcrop in the area precludes the possibility of any detailed structural analysis. Pillow top determinations coupled with grain gradation and cross-bedding observed in the metasediments do however indicate that the sequence has been relatively tightly folded with synclinal and anticlinal structures having northeast to east-trending axial plane traces. The Quartz Diorite Stock in Keefer Township appears to have been emplaced into an anticlinal structure.

Bedding and Foliation

The bedding in the clastic metasediments and in the intermediate to felsic tuffaceous rocks is marked by well defined parallel bedding planes. The wacke and arkosic wacke beds are sometimes graded and rarely cross-bedded.

The foliation which is defined by the subparallel orientation of micaceous minerals and by elongation of pyroclastic fragments is well-developed in these rocks which have been folded and regionally metamorphosed. Locally schistose rocks resulting from cataclastic deformation during fault movement define shear zones. Secondary foliation or crenulation cleavages occur often in conjugate sets, symmetrically oriented about the axial planes of the folds.

Joints

Jointing in several sets is common in all the rock types in the map area. Prominent joint directions, however trend north and northeast in the intrusive rocks and northwest and east in the supracrustal rocks. Some joints sets are filled with epidote and quartzo-feldspathic material.

Folds

The presence and orientation of the folds were largely determined from top determinations from pillows and lava flows in the metavolcanic rocks, and from grain gradation and cross-bedding in the metasedimentary rocks. Facing determinations suggest that folding of the supracrustal rocks produced a series of roughly east-trending isoclinal folds with steep northerly dipping axial planes and easterly plunging fold axes. There would appear to be two major synclines and anticlines in the map area (Figure 4). The axial plane trace of one syncline passes through metasedimentary rocks about 1 km north of the dam on the Mattagami River in Thorneloe Township and extends to the west north of the Tatachikapika River until it is truncated by a fault north of Godon Lake in Denton Township. There are two anticlines north and south of this syncline. The axial plane trace of the second syncline trends west and can be traced south of Highway

101. West of Godon Lake one anticline and one syncline extend into Keefer Township. The anticline exposed north of Keefer Creek on Highway 101 in Keefer Township plunges about 40° towards the east. The same anticline plunges about 68° to the northeasst on the hydro line about 1.5 km east of Opishing Lake.

Several S-and Z-shaped minor folds, with 70° to 80° easterly plunges, were observed in the supracrustal rocks. The presence of S-shaped folds in the iron formation in Thorneloe Township are suggested by the configuration of the magnetic contours. Small isoclinal folds as well as kinks and drag folds were observed at a number of places but are inadequate for any definite interpretation as to their relationship to the major folds.

Faults

Faults are prominent structural features in the map-area. They are indicated not only by the presence of shear and mylonitized zones in the supracrustal rocks but also due to the thick overburden their location is indicated by such features as:

1. off-set of geological boundaries.
2. Topographic lineaments and;
3 off-set in trend or abrupt termination of magnetic anomalies.

As the dip of the fault planes could not be measured the net-slip of the faults cannot be determined accurately.

Faults in the area form three prominent sets; the north-trending, the northwest trending and the northeast-to east-trending faults respectively. The northeast to east trending faults are probably the oldest faults in the area since they are displaced by the other faults sets. The northwest-trending faults appear to be younger than the north-trending faults.

North-Trending Faults

A number of faults trend north to a few degrees west of north. Most of the diabase dikes in the area appear to have been emplaced along these north-trending fractures. Most of these faults have dextral movements though sinistral movements have also occurred. From the off-sets of geological boundaries it appears that these faults have maximum displacements up to 500 m.

Northwest-Trending Faults

The northwest-trending faults have produced major sinistral displacements of the supracrustal sequence in the map-area. The strike of these faults varies from N25°W to N35°W. The maximum displacement along these faults, as indicated by the off-set in geological boundaries is in excess of 1 km as observed for the fault running through Godon Lake. Milne (1972 p. 57) concluded that the metavolcanic rocks in Keefer Township are equivalent to those in Sewell Township which means that more than 3 km of left lateral displacement has occurred along these faults. The ODM compilation maps of Ginn et al. (1964) and Pyke et al. (1973) indicate that these faults can be traced for considerable distances outside the present map-area.

Northeast-to East-Trending Faults

There are a few northeast-to east-trending faults in the area. The one which runs south of the Tatachikapika River in Denton Township and swings east in Thorneloe Township has produced more than 1.6 km left lateral off-set along its strike.

Another northeast-trending fault situated south of Highway 101, runs through Warren Lake in Keefer Township and swings east into Denton Township where it ends against a northwest-trending fault which passes through Godon Creek.

The orientation of Keefer Creek and Denton Lake is controlled by two east-trending faults. The latter fault probably represents the western limit of the Bristol Fault of Ferguson (1959d, p.21).

The Destor-Porcupine Fault (Pyke, 1980) which separates two main structural domains and represents a fundamental fracture in the Early Precambrian Crust was not positively located in the area. According to Ferguson (1959 d, p. 21) the Bristol Fault in Bristol Township represents the westward extension of the Destor--Porcupine Fault. He also suspected that the above described east-trending fault in Thorneloe Township could also represent a continuation of the Destor-Porcupine fault.

Ductile shear zones developed during fault movement are present in most of the old gold prospects. The gold-bearing quartz-carbonate and quartz veins are found in these shear zones.

Minor faults with off-sets of a few centimetres are abundant in the supracrustal rocks. Locally quartz or epidote veins up to a few millimeter wide occur along these faults.

Correlation of Lithologies and Aeromagnetic Data

The map area was covered by airborne magnetometer surveys at a scale of 1:63 360 flown during 1963 and 1964 for the Ontario Department of Mines and the Geological Survey of Canada (Map 2299 G). Aeromagnetic map 293 G was compiled and released by the

Ontario Department of Mines and Geological Survey of Canada from the 1947, 1948 and 1949 surveys filed by Dominion Gulf Company. Several mining companies have extensively investigated the map-area using airborne and ground magnetic surveys.

The aeromagnetic maps clearly show the trend of the ironstone and ultramafic rocks in the area which are characterised by magnetic highs in contrast to the magnetic lows over the felsic intrusive rocks.

The most magnetic rock in the area is ironstone, specifically where it reaches its maximum thickness in Thorneloe Township. The magnetic intensity rises to more than 5000 gamma's above the background of 58,000 gammas. Elsewhere in the area magnetic intensities due to ironstone are considerably lower.

The contact between the metavolcanic and felsic intrusive rocks lies between the 59,000 to 60,000 gamma contours depending upon the thickness of overburden.

Ultramafic to mafic metavolcanics show fairly strong magnetic intensities probably due to the presence of abundant magnetite. The area occupied by these rocks have magnetic intensities in the range of 300 to 600 gammas above background. Magnetic intensities of 100 to 200 gammas above background were interpreted to indicate the presence of mafic to intermediate metavolcanics. Felsic metavolcanics, pyroclastic rocks, quartz-feldspar porphyries and metasediments all have magnetic intensities of 0 to 100 gammas above background. Occasionally some of these rocks show a highly variable magnetic pattern due to the presence of iron-rich sediments or the erratic distribution of magnetite.

Due to their narrow width diabase dikes can not be distinguished on the aeromagnetic maps. On ground magnetic maps, however they are indicated by linear magnetic responses of from 400 to 600 gammas above background.

Economic Geology

Since the discovery of gold at Porcupine in 1909, there has been sporadic mineral exploration activity in the map-area, almost all confined to an evaluation of the gold potential of a few quartz veins and shear zones within the metavolcanic-metasedimentary rocks near their contact with granite or feldspar porphyry.

Except for minor working of the Thibeault claims in Thorneloe Township, there are no past or present producing mines. Thirty-two mines, however, some of which are still operating in the Timmins Camp 30 km to the northeast have produced more than 2 billion dollars worth of gold. Virtually all the production from the Timmins Camp has been from gold-bearing quartz-carbonate veins in metavolcanics and metasediments north of the Destor-Porcupine Fault (Pyke 1980).

Attention has been more recently directed towards the search for economic massive sulphide deposits which in some cases also contain precious metals. Recent geophysical exploration surveys in the map-area have outlined several conductive zones which, to date, on testing, have proved to be due to: 1) graphitic zones with or without disseminated to massive pyrite and pyrrhotite; 2) massive to disseminated pyrite and pyrrhotite in interbedded magnetite-chert ironstone and 3) disseminated pyrite and pyrrhotite in tuffaceous rocks of intermediate composition. Geochemical prospecting methods have been unsuccessful due to the thick overburden in the map area.

Mineral Occurrences:

Gold has been the major element of primary economic importance in the map-area and adjoining areas since its discovery at Porcupine in 1909. The iron formations in the map area are much too low in grade and thickness to be of economic interest at present. The search for nickel-chromium, base metals and asbestos in the area has been almost negligible.

Gold and Silver

The Regional Geologist's Assessment Files in Timmins indicate that most of the gold showings in the map-area are are located within shear zones in the metavolcanics or metasediments near the contact with felsic intrusive rocks or feldspar porphyry. Gold, occasionally containing some silver values, usually occurs together with sulphides such as pyrite, pyrrhotite, arsenopyrite, chalcopyrite and galena in quartz or quartz-carbonate veins. Other occurrences have been reported in irregular quartz veins and pyrite fracture fillings in the iron formation (see Jowsey Denton Gold Mines Limited occurrences in Carscallen Township north of Denton Township). In Thorneloe Township minor amounts of gold were produced from a quartz vein in sheared conglomerate and greywacke beds which lie within a few hundred meters of feldspar porphyry.

Although the origin of gold and associated silver in the map-area is open to a number of interpretations, several features can be noted which suggest their source. These features include:

(a) Most of the gold occurrences are located in shear zones at or near the granite and supracrustal rocks contact.

(b) Shear zones which host gold-bearing quartz-carbonate veins are, in addition, reported to contain pyrite, pyrrhotite, chalcopyrite and rarely galena.

(c) Gold-bearing shear zones within ultramafic, mafic and intermediate rocks contain quartz-carbonate veins and stringers containing pyrite, arsenopyrite and tourmaline. In the ultramafic rock suite it is the intercalated volcanogenic metasediments that are most commonly impregnated with mineralization and contain quartz stringers.

(d) When arsenopyrite is present the gold values are always associated with this mineral but not vice versa.

Iron

Outcrops of ironstone in the area are rare and generally consist of thin bands of magnetite separated by chert and metasedimentary beds. The outcrop in the southeastern quarter of Keefer Township appears to contain less than 10 percent total iron.

Sulphides:

Drill hole data (Regional Geologist's Assessment Files, Timmins) from a number of properties indicates that a number of thin disseminated massive zones of pyrrhotite and pyrite locally containing trace chalcopyrite occur predominantly in intermediate to felsic tuffaceous rocks which are usually interlayered with ultramafic flows. Disseminated to semi-massive sulphide mineralization also occurs in graphitic zones in the interbedded metasediments.

Nickel-Chromium

One grab sample of ultramafic composition collected by the author from the side of the gravel road about 1 km northeast of Godon Lake (see Hollinger Argus Property this report) in Denton Township, assayed 0.01 percent chromium (Analysis by the Geoscience Laboratories, Ontario Geological Survey). The rocks in this locality are thought to consist of sheared ultramafic flows or detritus derived exclusively from the ultramafic flows and redeposited by turbidity currents.

Asbestos

The peridotitic komatiite on Highway 101, south of the Tatachikapika River contains up to 16 cm wide by up to 3 m long veins of picrolite serpentine. Fibers up to 40 cm long were recovered from these veins by the author.

DESCRIPTION OF PROPERTIES

A written description of all properties (Table 4) for which assessment work has been filed with the Ministry of Natural Resources by December 31, 1981 is given. There are no records of any assessment work for some of the patented claim groups in Keefer Township. Figures 5, 6 and 7 show the approximate outline and position of claim groups in good standing, at the end of the year 1981, in Keefer Denton and Thorneloe Townships respectively.

1. Acme Gas and Oil Company Limited [1966]

In 1965, Acme Gas and Oil Company Limited held 32 unsurveyed claims, numbered P. 78363-78272 inclusive, P. 78596-78613 inclusive and P. 78384-78387 inclusive. Parts of the claim areas were previously held by Dominion Gulf Company (10) and Hollinger Consolidated Gold Mines Limited (23).

In 1966 combined airborne electromagnetic and magnetometer surveys of the property were carried out. Only three weak electromagnetic anomalies were detected two of which were related to conductive ironstone. The third anomaly appeared to be unrelated to any magnetic feature and was not explained. There are no records to indicate whether any further work was conducted on the property.

2. Aumo Porcupine Gold Mines Limited

Aumo Porcupine Gold Mines Limited holds a group of 6 patented mining claims (P. 8751, P. 8775, P. 10739, P. 10740, P. 11152 and P. 11153), near Mahoney Creek and overlapping Highway 101.

Extensive amounts of trenching and diamond drilling have been done on the property between 1910 and 1925 and several pits have been sunk to a depth of from 3 to 11 m. During 1944 to 1946, 60 diamond drillholes with an aggregate length of about 5488 m were drilled on the property. The drilling located vein Number 2, situated in the southern parts of claims P. 8751 and P. 10739, which contains 2 lenses of ore. To May 1949, 18 holes had been drilled on lens Number 1 which outlined 29,362 tons (average depth 58 m, length 213.5 m) grading 0.12 ounces Au, 2.03 ounces Ag and 43 ounces of Cu per ton. Lens Number 2 has been outlined by 6 diamond drill holes for a length of 140 m with an average combined grade of 0.21 ounces Au, Ag, and Cu per ton across a width of 0.76 m. Actual gold content (excluding Ag and Cu) in this lens is 0.18 ounces per ton.

Diamond drilling about 61 m west of Number 2 lens returned excellent values of 0.24 ounces Au per ton across 3 m and 0.19 ounces Ag per ton across 6 m. The recalculated combined assay values in core samples for the high grade vein to the north varied from trace to 3.40 ounces of gold per ton. The compilation of values give the following estimate of the mineralized zone in this high grade vein.

Incident length	100 m
Average width	0.46 m
Average depth	47 m
Average grade	0.91 ounces Au per ton.

The lenses of ore are located within a shear zone in tonalite-quartz diorite which strikes N75°W and dips 75° north from the metavolcanic contact. The mineralization consists of seams of pyrite and chalcopyrite and also disseminated grains of these sulphides in the altered granite.

Eight diamond drill holes intersected the Number 3 vein over a length of 260 m and a depth of 100 m. Some encouraging results were obtained but they failed to prove-up to economic grade. The vein is entirely within the metavolcanics and follows a graphitic shear zone that may have been originally a lens of slaty metasediments. Mineralization is largely coarse pyrite.

There are sections in the acid metavolcanics that are heavily mineralized with pyrrhotite and chalcopyrite with low gold values. The best values were found in the graphitic zone where it is heavily mineralized with massive pyrite in blebs and seams. The pyrite makes up 20 percent of the mineralized zone and values in this zone varied between 0.06 to 0.30 ounces Au per ton.

Four holes were drilled to explore the Number 1 vein which is located in a north striking shear in granite on the northern township line west of Mahoney Creek.

Five holes were drilled on vein Number 5. The mineralized zone on the basis of the central 3 holes, gave about 104 m of 0.91 ounces per ton Au over a width of 0.46 m but was not intersected in holes drilled along strike at both ends.

A sheared graphitic schist was intersected in hole Number 13. The footwall for 3 m is a sericite-carbonate schist, probably a sheared acid metavolcanic, and the hanging wall is an altered band of tuff or metasediments which is highly carbonatized and is perhaps equivalent to vein Number 4.

Current exploration work by the company includes diamond drilling in the summer of 1981. Thirteen diamond drill holes were located by the field party in the claim area during field mapping. The author has no information about the results of this drilling.

The property is underlain by tonalite-quartz diorite in contact with metavolcanics. The tonalite-quartz diorite is a grey, biotite-bearing variety and is intruded by quartz porphyry which strikes N80°W. The metavolcanics, dominantly felsic in composition consist of crystal tuffs with interbedded argillaceous metasediments. These rocks at many places have been sheared and changed to sericite-carbonate schists and sheared graphitic material respectively. Diabase dikes intrude the metavolcanic-metasedimentary sequence as well as the felsic intrusive rock.

3. Bartleman Estate

P.J. Bartleman Estate holds 4 patented claims numbered P. 28779-P.28782 inclusive in the northwest corner of Keefer Township.

Five different quartz veins are present on the property. The most southerly vein, which was exposed for a length of about 46 m varies from 0.15 to 1.25 m in width. Vein material consists of smoky quartz containing pyrite and a little chalcopyrite. Assays of the channel sample from this vein gave 0.83 ounces gold and 2.20 ounces silver per ton across a sampled width of 0.15 m.

A second vein varies from 0.76 m to 1.2 m in width (lateral extent not known). Assays of channel samples from two trenches gave 0.84 ounces gold and 2.04 ounces silver per ton across 1.2 m and 0.47 ounces gold and 0.88 ounces silver per ton across 0.76 m respectively. Two bulk samples taken from vein material at the collar of the test pit assayed 1.08 and 1.14 ounces of gold, 3.28 and 2.84 ounces of silver per ton respectively. The vein contains white to smoky white quartz and is well mineralized with pyrite, a little chalcopyrite and traces of galena.

Approximately 75 m northwest of the above veins are three more parallel veins striking 60° to 70° east of north and dipping steeply south. The most northerly vein, which is exposed at two places about 30 m apart, varies from 0.3 to 0.75 m in width. Assays of samples from this vein gave 0.15 ounces of gold per ton across 0.36 m and 0.01 ounces gold per ton across 0.76 m. Channel samples from the second vein, which is about 10 m south of the most northerly vein and 7.6 m in length assayed 0.36 ounces of gold and 1.28 ounces silver per ton across a width of 1.2 m. Assays of samples from the third vein located about 15 m south of the second vein gave 0.7 ounces gold and 2.5 ounces silver per ton across 0.2 m. The same vein about 30 m west assayed 0.56 ounces gold and 1.82 ounces silver per ton across 0.3 m. All three veins contain dark coloured quartz, fairly well mineralized with pyrite, some chalcopyrite and a little galena.

The wall rock of all five quartz veins is highly sheared andesite and andesite tuff which strikes about N 60°W and has steep southerly to vertical dips.

In November and December 1946, six diamond drill holes with an aggregate length of 733 m were collared in the vicinity of these veins. The drilling, however, showed "nil" to "trace" gold values over 0.25 to 0.84 m of core at deeper levels. The diamond drill holes intersected andesite to andesite tuff intruded by feldspar porphyry and both intruded by diabase dikes.

During 1961-1962 Hollinger Consolidated Gold Mines Limited collared 7 diamond drill holes in the metavolcanic rocks within the above property, totalling about 1000 m in total length. The holes intersected massive (flows?) and pyroclastic rocks of intermediate to felsic composition, feldspar porphyry, and granitic rocks.

There is no record of any further exploration work performed on the claim area.

4. Brown McDade Mines Limited

Brown McDade Mines Limited hold 11 unsurveyed claims (P. 554597-P.554603, P. 554603, P.539619, P.539622, P. 567640 and P.567641) overlapping Cripple Creek north of Highway 101. The claims were previously held by Jowsey Denton Gold Mines Limited (32)

Magnetometer and VLF-electromagnetic surveys in 1980 delineated several zones of interest, the main one being a zone extending across the claim group near and south of Cripple Creek. It is on this zone, at different points, that high grade grab and chip samples have been taken, and also where a shaft is located.

From October 1980 to May 1981, 8 diamond drill holes, totalling about 129 m, were collared on claim P. 554599. The drillholes intersected massive to pillowed andesite and andesite tuff intercalated with dacite and rhyodacite tuffs.

Surface geology is similar to rocks encountered in the drill holes. Andesite flows, pillowed flows and related breccias occur interlayered with minor dacite tuffs. A small gabbroic sill intrudes the metavolcanic rocks. The area north of Cripple Creek is underlain by grey to pink tonalite.

5. Canadian Nickel Company Limited [1979]

In 1979, Canadian Nickel Company Limited held a group of 22 contiguous unsurveyed claims (P. 470907-P. 470918 inclusive P. 471795 - P. 471799 inclusive, and P. 471915 - P. 471919 inclusive) immediately south of the Aumo Porcupine Gold Mines Limited claims. The southern claim of the property overlapped Cripple Creek.

Major parts of the claim area were previously held by Dominion Gulf Company (9) and Maridian Mining and Exploration Company Limited (33).

Canadian Nickel Company Limited, after acquiring the claims in 1977 reexamined several anomalies from the previously conducted geophysical work in the area. In August 1977, they collared a diamond drillhole to the depth of about 90 m on an electromagnetic conducter. The drillhole intersected graphite and pyrite in a fault zone which was considered the cause of the conductor.

In February 1978, ground magnetometer and vertical loop electromagnetic surveys of the claim area were completed. The purpose of the magnetic and electromagnetic surveys was to outline the possible presence of mafic and ultramafic rock that may contain disseminated magnetic minerals such as magnetite and specifically pyrrhotite which may be associated with possible gold, copper, lead and zinc mineralization in areas covered with overburden.

The survey outlined a broad magnetic anomaly in the southeast corner of the claim block, and one in the central section of the group near the west border of the claim group which were interpreted to be due to mafic or ultramafic rocks. A linear magnetic anomaly associated with the conductor in claim P. 470908 was considered to be due to magnetic sulphides.

In May 1978, Canadian Nickel Company Limited carried out a geological survey of the claim group. The property has little outcrop. Extensive swamp areas and glacial deposits cover most of the claim area.

The claim area is underlain by ultramafic to mafic metavolcanic rocks near the southeast corner and intermediate to felsic metavolcanic rocks interbedded with metasediments and tuffs in the northwest part. The intermediate to felsic metavolcanics have been highly deformed to gneissic rocks. The felsic metavolcanics are grey to white dense dacite and dacitic lappili tuff that contain blebs of pyrrhotite and pyrite. Highly sheared quartz-muscovite schist represents highly deformed metasediments. Samples from outcrops were assayed by the company for copper, zinc, and gold. The assay values are generally low. The samples from near the long conductor north of Cripple Creek have only slightly higher copper, zinc and gold values. The assay results reported by the company are as follows:

Field No.	Cu (ppm)	Zn (ppm)	Au (ppb)
JJH 78-1	75	50	Not Assayed
JJH 78-2	Not Assayed	Not Assayed	5
JJH 78-3	90	55	Not Assayed
JJH 78-4	15	75	Not Assayed
JJH 78-5	415	60	1
JJH 78-6	35	125	Not Assayed
JJH 78-7	Not Assayed	Not Assayed	5
JJH 78-8	65	135	Not Assayed
JJH 78-9	30	145	Not Assayed
JJH 78-10	10	105	Not Assayed
JJH 78-13	Not Assayed	Not Assayed	50
JJH 78-14	75	100	45
JJH 78-15	115	2650	5
JJH 78-16	30	50	Not Assayed
JJH 78-17	45	95	10

The best value of 2650 ppm Zn comes from an old pit through which the conductive horizon passes.

In May and June of 1980, the company drilled 4 diamond drillholes in the claim area with an aggregate length of 372 m. Drillholes B.H. 40660-0 and B.H. 40661-0 both were collared in claim P. 470908 while holes B.H. 40662-0 and B.H. 40663-0 were collared in claims P. 470911 and P. 470916 respectively. The drillholes intersected interlayered intermediate flows and tuffs containing layers of interbedded chert and mudstone with rare chert-magnetite ironstone. The tuffaceous layers contain 0 to 8 percent pyrite and pyrrhotite and may contain up to 60 percent intercalated chert. The diamond drillhole logs do not indicate that any samples were assayed.

There is no record of any further exploration work performed on the claim area.

6. Cominco Limited [1971]

In 1970 Cominco Limited held 70 unsurveyed claims (P. 293703 - P.293764 inclusive and P.293768 - P.293775 inclusive) in the northeast quarter of Keefer Township. The claim group partially overlapped the previously held Hollinger Consolidated Gold Mines Limited claims (26).

In May 1971, the company contracted Dighem Limited who, using a FH-1100 helicopter equipped with AM-104 magnetometer, Triad sequence camera and Digham electro-magnetic unit, surveyed the area. No significant electro-magnetic anomalies were located.

The claim area is entirely underlain by felsic intrusive rocks of granite and granodiorite composition intruded by late quartz diabase dikes.

There is no record of any further exploration work on the claim area.

7. Derby G. [1938]

In 1938, George Derby held two groups of claims: the Thibeault-Derby Group located west of Wawaitin Dam and the Derby East Group located south of the Power Station in Thorneloe Township.

The Thibeault-Derby Group consisted of a block of 9 surveyed claims numbered P.17993 - P.17995 inclusive, P.18336; P.18337, P. 7556 - P.7558 inclusive and P. 28218. The few outcrops in the claim area consist of sheared carbonatized rock with numerous quartz stringers which contain pyrite and galena. For further information see under Thibeault Y. et al. (54).

The Derby East Group consisted of 12 unsurveyed claims numbered P.23116 - P.23121 inclusive, P. 23125-P. 23127 inclusive, and P.23180 - P.23182 inclusive. There is no outcrop in the area. However, the author's indicate of the geophysical surveys in the area that the claim area interpretation is underlain by ironstone and metavolcanic and metasedimentary rocks. There is no record of any work performed on the claim group.

8. Dodds T. [1938]

W.D. Harding and L.G. Berry (1938) described the property as follows:

> "Thomas Dodds, of Timmins, holds a group of 8 claims, which include two surveyed claims, P. 17,791 and 17,792. This group is situated at the south end of Godon lake. Part of the ground was staked and surveyed in 1910 and at that time was known as the Godon Group. Part of the Godon group has since been restaked by Thomas Dodds. The rocks consist of massive greenstones intruded by granite and several diabase dikes. The greenstones strike N. 30°E. and dip steeply to the northwest. Stripping and trenching has uncovered several small quartz veins, which carry carbonates and coarse pyrite. The veins occur in strong but narrow shear zones in the greenstones, which strike approximately northeast."

There is no record of any further work performed on this claim area.

9. Dominion Gulf Company [1950]

In 1949-1950, Dominion Gulf Company held a group of 35 claims; (P.35696 - P.35719 inclusive and P.36239 - P.36249 inclusive) partially overlapping but mostly southwest of Cripple Creek south of Highway 101.

In the summer of 1950, geological and ground magnetometer surveys of the claim area were completed. The results of the magnetometer survey indicate that the magnetic relief is not very great in the claim area. Some anomalies trending west of north have been interpreted to be due to diabase dikes.

The claim area is underlain by a metavolcanic-metasedimentary sequence intruded by diabase dikes. The metavolcanics are intermediate to felsic, fine to medium-grained massive flows with minor interflow pyroclastics.

10. Dominion Gulf Company [1951]

During 1950-51 Dominion Gulf Company held two claim groups of 57 unpatented claims: 34 in Thorneloe Township numbered P. 35694, P.35695, P.35727 -P.35737 inclusive, P.35738-P.35758 inclusive; and 23 in Denton Township (numbers not given in assessment files). The company was mainly interested in looking for gold deposits. There is no record of any previous work in the claim area.

In the second half of 1950 the company conducted a ground magnetometer survey over the Thorneloe claim group. A series of peridotite units were interpreted to be present on the basis of high magnetic strength and location of an outcrop of peridotite near the western boundary of claim P. 35756. Heavy east-west shearing in the peridotite as well as the presence of a talcose tuff near the boundary of claims P. 35750 and P. 35748 suggests the presence of a fault zone. Westwards this fault zone appears to be less well developed. Based on magnetic interpretation further exploration by diamond drilling was recommended.

During the spring of 1951 the company collared 4 diamond drillholes with an aggregate length of 570 m. Diamond drillhole DDH #1, located in claim P. 35747, encountered altered peridotite, intermediate pyroclastic rocks and dark grey-green lava. The second hole DDH #2, collared in claim P. 35743, encountered andesite tuffs interbedded with ironstone. Holes DDH #3 and DDH #4, located in claim P. 35742, passed through mafic to ultramafic flows and intermediate to felsic tuffs interbedded with an unit of interbedded ironstone and chert more than 30 m thick. Geology of the area is described under the Redsucker Claim Group of Hollinger Consolidated Gold Mines Limited (23).

In Denton Township a ground magnetometer survey was conducted on claim P. 35723 only. A total of 3.85 km of line were covered reading 111 stations. The survey indicated one anomaly displaced by a fault and probably caused by iron formation. No further exploration work by the company is reported for the claim group.

11. Ellery C.R.

Roy C. Ellery holds 5 patented claims numbered P. 8710, P. 8756, P. 8790, P. 8941, and P. 8951 overlapping Boom Lake and Highway 101 in the south-central part of Keefer Township. There is no record of any exploration work performed on these claims.

12. Falconbridge Nickel Mines Limited [1972]

In 1971, Falconbridge Nickel Mines Limited acquired a group of 12 unsurveyed claims (P. 326700-P. 326711 inclusive), near the western boundary of Denton Township. From 1945 to 1947 parts of the claim area were owned by A.E. Phillips (41) and Paymaster Consolidated Mines Limited (40).

In June and July of 1972 a ground magnetometer survey of the entire property was conducted. The survey results yielded a rather vague pattern of narrow linear zones trending north and east. The narrow linear high that trends east along the southern boundary of the claim area was interpreted by the company to be due to an iron formation. The narrow north-trending zones may reflect the presence of diabase dikes.

The claim area cover a northeast-trending sequence of andesite and associated schists and tuffs. The metavolcanic rocks are cut by several roughly north-trending diabase dikes.

13. Gagnon Property

The Gagnon Property consists of 14 unsurveyed claims (P. 525332 - P. 525341 inclusive and P. 525382 - P. 525385 inclusive), overlapping the Denton-Carscallen boundary, on both sides of Aumo Porcupine Gold Mines Limited claims. Some of the claims were previously held by Jowsey Denton Gold Mines Limited (32).

In 1979 ground magnetometer and electromagnetic surveys of the claim group were carried out.

The magnetic data indicates the presence of roughly north-trending diabase dikes in the west-central part of the claim area. A series of north-norhteast trending magnetic anomalies on the Aumo Gold Mines Limited property extend into the eastern parts of the Gagnon property and probably are due to pyrrhotite-graphite zones within the metavolcanic rocks.

A number of electromagnetic anomalies on the property may be related to either sulphide-bearing shear zones or to pyrrhotite-graphite horizons similar to those that host gold mineralization in the adjoining Aumo Gold Mines Limited property. There is no record of any further exploration work conducted by the company.

The claim area is underlain by metavolcanic rocks that have been intruded by granitic rocks. The northwest part of the property is underlain by grey biotite granite containing lenses of quartz porphyry. The granite-metavolcanic contact in the property strikes east.

There is no record of any further exploration work conducted on the claim area.

14. Galata F. [1959]

In 1959, Galata F. held a group of 12 claims (P. 47266-P. 47270 inclusive, P. 45053-P. 45055 inclusive, P. 45036-P. 45038 inclusive, and P. 45057) in the southeast corner of Keefer Township. There is no record to show any previous exploration work done in the claim area.

The Galata Brothers did some trenching in the claim area and exposed some magnetite ironstone. R.M. Ginn then Resident Geologist in Timmins visited the property in June, 1959 and described it as follows:

"The rock of principal interest is an east-west trending iron formation, traceable on the Department of Mines and Technical Surveys Geophysics paper 292, the Dana Lake areomagnetic map. To the south of iron formation are tuffs and massive andesite flows. To the north is a coarse-grained gabbroic and dioritic hybrid rock......

By the examination of the formation at two localities, and by cross-traversing with the dip needle, it was discovered that the magnetite strata have a maximum surface width of 65 feet. Because the dip is about 75° north, this is close to the true maximum thickness along the 900 feet of strike investigation. The magnetic zones are discontinuous along strike......

The banded rock is composed of alternating quarter-inch to three quarter-inch thick layers of fine-grained magnetite and argillite-chert. At the trenched exposure the rock is quite spectacular, consisting of medium-grained, steel grey magnetite, and epidote. It seems likely that the rock has here suffered recrystallization and metasomatic alteration by the basic intrusives to the north. Minor disseminated chalcopyrite occur in both the epidote and magnetite layers."

In 1964 PCF Exploration Limited optioned the claims and drilled 2 diamond drillholes with an aggregate length of about 64 m, to investigate a zone of pyrite-pyrrhotite mineralization in the banded iron formation. The exact location of the drillholes is not known. The holes intersected coarse-grained diorite, interlayered with the iron formation that contained barren pyrite and pyrrhotite mineralization.

From 1970 to 1978 E. Galata held a number of claim groups.

The exploration work on these claims was, however, limited to trenching and is summarized below.

		Work Performed	
Year	Claim Number	Number of trenches	Other
1970	(P.216771	1	--
	(P.216772	1	--
1973	P.371395	7	--
1974	(P.371394	1	--
	(P.371395	1	--
	(P.371402	2	--
1975	(P.371394	1	--
	(P.371400	3	--
	(P.325906	3	Blasting
1976	(P.325907	1	--
	(P.371402	1	--
	(P.371394	1	--
1977	(P.463589	3	--
	(P.463590	2	--
1978	P.463590	1	--

There is no record to show what commodity the Galatas were exploring for and rock types they encountered. The area is underlain by felsic to intermediate metavolcanic rocks interlayered with metasediments and mafic to intermediate metavolcanic rocks.

15. Gambit Consolidated Explorations Limited [1979]

Gambit Consolidated Explorations Limited, in 1977, staked a group of 9 claims (P. 500439-P. 500443 inclusive, P. 501150, P. 501151, P. 501294 and P. 501295) overlapping Mahoney Creek about 3 km south of Highway 101.

The earliest work reported on the claim area is by Hollinger Consolidated Gold Mines Limited (19). They drilled 13 holes in the vicinity of an excavation on the east bank of Mahoney Creek that shows east-trending gold-bearing quartz veins in the carbonatized mafic to ultramafic rocks. In 1972, the property was optioned by Maridian Mining and Exploration Company Limited (33). They completed magnetic and electromagnetic surveys on a large block of the claim group including the gold showing and drilled 4 shallow holes. No gold values were reported in the drill logs.

In December 1977, ground magnetometer and electro-magnetic surveys of the claim area were completed. The east-northeast trending metavolcanic assemblage consists of ultramafic to mafic massive and pillowed flows which have been offset by north-trending faults. The southern portion of the claim area is underlain by metasediments that consist of wacke and slate. Intermediate metavolcanics consisting of andesite flows and andesite-dacite tuff separate the ultramafic to mafic metavolcanics and metasediments.

In September 1979, Gambit Consolidated Explorations Limited drilled 3 holes totalling 275 m in the vicinity of the gold showing at Mahoney Creek. Hole Number 79-1 was collared near the southern boundary of claim P. 501150 and intersected serpentinized ultramafic flows which contain pyrite crystals along its entire length. Hole Number 79-2 was collared near the center of claim P. 500439 and also intersected carbonatized serpentinized ultramafic flows. Hole Number 79-3 located in the southeast corner of claim P. 501150 also intersected serpentinized ultramafic metavolcanic flows containing disseminated pyrite, pyrrhotite and magnetite crystals.

There is no record of any further exploration work by the above company in the claim area.

16. Gertie Gold Syndicate: [1948]

In 1946 Gertie Gold Syndicate held two groups of claims numbered P. 29428, P. 33637, P. 33628 and P. 33645 (northern group); and P. 28863, P. 28803, P. 28806 and P. 28868 (southern group). The northern group included one surveyed claim, number P. 33637. The northern claim group was located north of, and partially overlapping the Tatachikapika River. The southern group was located immediately south of the river about 5 km east of the western township boundary.

During 1946-47 the company collared 3 diamond drillholes, totalling 600 m in length in claim number P. 33637 of the northern group. They intersected wacke intruded by 15 to 50 cm wide feldspar porphyry dikes. The metasediments contain sparsely distributed pyrite and rarely chalcopyrite. During this period two holes totalling about 445 m in length were also drilled in claim number P. 28863 of the southern group. Hole Number 1 passed through 206 m of wacke intruded by about 48 m of feldspar porphyry. Hole Number 2 intersected 109 m of wacke interlayered with 84 m of deformed polymictic conglomerate with minor sparsely distributed pyrite and chalcopyrite mineralization.

In the spring of 1947 the company conducted a ground magnetometer survey of the southern claim group to expand the geological informations obtained from the diamond drilling and to locate the metavolcanic-metasedimentary contact to the south. The survey outlined 3 anomalies, 2 of which were interpreted to be due to respectively ironstone and a fault situated along the metavolcanic-metasedimentary contact. The third anomaly was not explained. A further detailed magnetometer survey and 2 diamond drillholes about 424 m in aggregate length were recommended but there are no records to show that the work was ever completed.

The entire northern claim group is underlain by metasediments consisting of interlayered wacke and siltstone. The southern claim group is underlain by conglomerate, wacke, siltstone quartzite and ironstone. Small quartz veins and lenses, minor porphyries and diabase intrude the metasediments. To the south the metasediments are in contact with metavolcanics, that consist mainly of andesite, basalt, agglomerates and tuffs, with intercalated metasediments and ultramafic flows.

17. Goldale Mines Limited [1946]

Goldale Mines Limited in 1933 optioned the Moore claims (37) situated in southwest Keefer Township and further stripped, pitted and trenched the quartz veins carrying pyrite, chalcopyrite, and galena mineralization. In 1937 or 1938, the company completed some diamond drilling in the vicinity of the quartz veins. The holes (number not known) are said to have been not more than 46 m in total length. No records or location maps covering this drilling are available.

18. Gowest Gold Resources Limited

Gowest Gold Resources Limited holds 11 unsurveyed claims (P. 500439-P. 500443 inclusive, P. 501150, P. 501151, P. 501294, P. 501295, P. 539974 and P. 539975) about 3 km south of Highway 101 overlapping Mahoney Creek.

Gold has been known to be present on the eastern bank of Mahoney Creek since the 1950's. The previous work on the gold showing was conducted in 1955 to 1956 by Hollinger Consolidated Gold Mines Limited (19), in 1972 to 1973 by Maridian Mining and Exploration Company Limited (34) and in 1979 by Gambit Consolidated Explorations Limited (15)

In the summer of 1981 an area of 17 by 115 m on the east side of Mahoney Creek was stripped around the gold showing. Channel sampling across the mineralized zone gave an average of 0.03 ounces per ton gold on the east side of the stripping and 0.07 ounces per ton gold on the west side of the stripping.

Two grab samples of the mineralized zone, collected by the author, were found to contain 0.01 and 0.12 ounces of gold per ton (analyses by the Geoscience Laboratories, Ontario Geological Survey, Toronto). The company is presently drilling the property.

The mineralized zones in the stripped area appear to be restricted to the intercalated metasediments in the ultramafic metavolcanics. The zones are highly carbonatized and impregnated with abundant pyrite and arsenopyrite. Quartz veins and stringers within the zone contain pyrite, arsenopyrite and tourmaline.

In the claim area the oldest rocks are ultramafic to mafic metavolcanic flows and pillow lavas. Overlying these are intermediate flows and tuffaceous rocks which are interlayered with and grade upward into metasediments consisting of wacke and slate with rare polymictic conglomerate.

19) Hollinger Consolidated Gold Mines Limited [1956]
(Halpenny Option)

In 1955, Hollinger Consolidated Gold Mines Limited optioned 10 Halpenney claims (P.37890, P.37891, P.37911 - P.37913 inclusive, P.37951, P.37952, P.38412, P.38413 and P.39878) overlapping Mahoney Creek, about 3 km south of Highway 101. In the early 1950's, Halpenney had originally acquired these claims from A. Galata. No exploration work was carried out by either of the previous owners.

Hollinger Consolidated Gold Mines Limited carried out some trenching and diamond drilled 13 holes totalling about 1241 m in length on gold showings (Galata showings) and their extensions. Drillholes Number 1 to 12 were collared in claim P. 37952 while hole Number 13 was collared in claim P. 37890 west of Mahoney Creek. All the drillholes intersected ultramafic to mafic metavolcanic rocks. Three other diamond drillholes, Numbers 14, 15, and 16, totalling 286 m in length were collared further south in claims P. 38412 and P. 38413. Holes Number 14 and 16 intersected metasediments while hole Number 15 intersected about 41 m of intermediate to felsic metavolcanic tuff and the remainder wacke. Economically interesting gold values were encountered in 6 of the diamond drillholes extending over a total length of approximately 180 m in ultramafic to mafic metavolcanics. Averaged values in the drillholes from west to east are indicated as follows:

Drillhole 1	0.23 ounces per ton over 2.2 m
Drillhole 2	0.39 ounces per ton over 1.5 m
Drillhole 3	0.22 ounces per ton over 0.5 m
Drillhole 4	0.32 ounces per ton over 1.5 m
Drillhole 6	0.25 ounces per ton over 1.45 m
Drillhole 8	0.26 ounces per ton over 2.75 m
Drillhole 8	0.18 ounces per ton over 0.9 m

In 1956 a geological survey of the entire claim group and surrounding area, and a ground magnetometer survey of half of the claims were completed. The magnetometer survey indicates that the rock formations extend to the east and west in the area. The northern parts of the claim area are underlain by metavolcanic rocks consisting of ultramafic to mafic flows, pillowed lava and related breccia, and pyroclastic rocks intercalated with metasedimentary rocks. These rocks are overlain to the south by intermediate flows and tuffaceous rocks intercalated with metasedimentary rocks. Near the southern boundary of the claim block all the outcrops are metasedimentary rocks consisting of wacke and slate with minor polymictic conglomerate.

20. Hollinger Consolidated Gold Mines Limited [1957]

In 1959 Hollinger Consolidated Gold Mines Limited held two groups of claims overlapping the Denton-Thorneloe and Bristol-Thorneloe Township boundaries. The Denton-Thorneloe group consisted of 23 claims numbered P.40232, P.40233 and P.45308 - P.45382 inclusive in Thorneloe Township numbered P.45377 - P.45380 inclusive, P.45384 - P.45388 inclusive, P.42391 - P.45393 inclusive, P.45396 - P.45398 inclusive and P.45401 - P.45403 inclusive were located in Denton Township. The Bristol-Thorneloe group consisted of 25 unpatented claims of which 8 claims numbered P.45510, P.45513, P.45516, P.45519, P.45520, P.44655, P.44656, and P.44661 were located in Thorneloe Township while the remainder were located in Bristol Township. Claim P. 45383 in Denton Township overlapped the Dominion Gulf claims of 1955-56 (9).

In the spring of 1959 the company conducted ground magnetometer and electromagnetometer surveys of the Bristol-Thorneloe group and an electromagnetic survey of the Denton-Thorneloe group.

Bristol-Thorneloe Claim Group

Out of 5 electromagnetically located conductive zones, 2 correspond with the magnetic anomalies which are due to mafic metavolcanic rocks and diabase dikes. Further electromagnetic, geological and geochemical work was recommended to ascertain the significance of the remaining conductive zones and magnetic anomalies. In 1958, 7 diamond drillholes with the aggregate length of 1835 m were collared in the claims situated in Bristol Township about 300 m north of the boundary with Thorneloe Township. The drillhole data indicate that thin units of metavolcanic and metasedimentary rocks are intercalated and are intruded by coarse-grained ultramafic rocks.

Rock outcrops in the area are sparse. West of highway 144 near the township boundary they consist of mafic metavolcanic rocks having the morphology of thick massive or pillowed flows and hyaloclastites.

Denton-Thorneloe Claim Group

As a result of the electromagnetic survey, 7 conductive zones were located near the Highway 144 bridge on the Tatachikapika River and the Denton-Thorneloe Township boundary. Due to the lack of outcrop the reason for the conductors was not determined. Further geophysical, geochemical and diamond drilling in the area were recommended to determine the nature of these conductive zones.

From October 1958 to May 1959 the company drilled 6 holes with total length of about 128.5 m. Hole PS.1 in claim P. 45397 encountered coarse-grained ultramafics; PS. 2 and PS. 3 in claim P. 45392 encountered rhyolite tuff, and holes PS. 4, PS. 5, and PS. 6 in claim P. 45396 encountered interbedded tuffs and metasedimentary rocks. No significant sulphide mineralization was encountered.

There are very few outcrops in the area. The outcrops south of the Tatachikapika River on Highway 144 are of medium-grained peridotitic komatiite. North of the river there are 3 small outcrops of felsic volcanic tuff and lapilli-tuff. There is no record to show any further exploration work.

21. Hollinger Consolidated Gold Mines Limited [1960]

In 1960, Hollinger Consolidated Gold Mines Limited held 18 unsurveyed claims (P.40217 - P.40226 inclusive, P.40231, P. 40232, P.45377 - P.45379 inclusive, P.46191, P.46192, and P. 46194) overlapping the Denton-Thorneloe Township boundary near the 4 mile post. There is no record of any previous work in the claim area.

In September 1960, Hollinger Consolidated Gold Mines Limited collared one diamond drillhole in claim P. 46191 with a length of approximately 422 m. The drillhole encountered metasediments consisting of wacke and slate along its entire length.

There is no outcrop in the area. Extension of the metasedimentary-metavolcanic contact through the claim area indicates that the southeastern parts are likely underlain by metasediments and northwestern parts of the area by intermediate to felsic metavolcanic rocks.

There is no record of any further exploration work performed in the area.

22. Hollinger Consolidated Gold Mines Limited [1961]
Kenogamissi Lake Group

In 1960-1961 Hollinger Consolidated Gold Mines Limited held a group of 42 unsurveyed claims numbered P. 49878-P. 49919 inclusive overlapping Kenogamissi Lake and Hydro Bay in Thorneloe Township. The area underlain by claims P. 49891, P. 49893, and P. 49896 was a part of the Derby East Group (7) in 1938, but there is no record of any exploration work in the area.

In the spring of 1961, Hollinger Consolidated Gold Mines Limited drilled 4 holes with a total length of about 476 m. The holes were collared in claims P. 49914 and P. 49918. All the holes intersected amphibolitized intermediate lava, intermediate tuffs and sulphide ironstone containing barren pyrrhotite and pyrite. The claims were allowed to lapse. There is no record of any further work in the area.

23. Hollinger Consolidated Gold Mines Limited
(Redsucker Claim Group) [1962]

During 1960-62 Hollinger Consolidated Gold Mines Limited held a group of 28 unsurveyed claims numbered P.49466 - P.49493 inclusive, in Thorneloe Township between the Tatachikapika River and Kenogamissi Lake. Most of the claim area was previously held by Dominion Gulf Company Limited (10).

During the early part of 1961 Hollinger Consolidated Gold Mines Limited carried out ground magnetometer and electromagnetic surveys of the entire property.

Two major linear magnetic features were picked up by the magnetometer survey. The first linear feature extends from the west side of the property immediately south of the river. The boundaries of this anomaly are defined by the 38000 gamma isomagnetic lines which have internal peaks in the range of 50,000 to 70,000 gammas. Going eastward, the anomaly decreases in width. The anomaly was interpreted to be due to ironstone. The second linear feature is less well defined but is characterized by the 38,000 gamma contour enclosing higher local peaks. The anomaly starts south of the river near the western boundary of the property and swings southeast then back to east. The highest peak occurs west of a small lake in claim P. 49472 and was drilled by the former owner (Dominion Gulf Company Limited). The hole intersected a narrow width of magnetite-bearing ironstone in mafic metavolcanic rocks, which was interpreted to be the likely cause of this anomaly.

The electromagnetic survey delineated more than 10 conductive zones. Except for two zones the cause of which were not determined, all the other conductive zone were interpreted to be caused by disseminated sulphides in ironstone.

During the fall of 1961 to the spring of 1962 the company conducted another electromagnetic survey of the entire property. This survey outlined the same two belts of high magnetic intensity (see above). The conductors within the ironstone were interpreted to be due to disseminated sulphide mineralization. Diamond drilling was recommended to determine the economic potential of this mineralization.

Three diamond drillholes with an aggregate length of about 700 m were collared in the claim group in the fall of 1962. Drillhole RS.1 located in claim P. 49466 intersected intermediate tuff containing magnetite, and ultramafic rocks. Drillholes RS.2 and RS.3 passed through ironstone interlayered with tuffs and ultramafic rocks. The conductive zones were found to be due to barren pyrrhotite and pyrite mineralization in the ironstone.

The company also conducted a geological survey of the claim area. Outcrops within the property are sparse and consist of peridotite and andesite tuff. Magnetic patterns, also indicate that there is a shear zone running parallel to the river and there are a few cross-cutting, north-trending faults. There is no record of any further exploration work by the company.

24) Hollinger Consolidated Gold Mines Limited
(Cripple Creek Claim Group) [1962]

During 1959 to 1962 Hollinger Consolidated Gold Mines Limited held a group of 31 unsurveyed claims P. 48236 to P. 48239 inclusive, P. 48240-P. 48249 inclusive, P. 48250-P. 48259 and P. 48260 to P. 48266 inclusive about 4 km south of Highway 101 near the center of Denton Township. There is no record of any previous exploration work within the claim area.

During the period August to October, 1960 two different electromagnetic surveys of the claim area were completed. A geological survey of the claim area was also completed during this time. From October to December 1960 a ground magnetometer survey of the claim area was completed using a Sharpe A-4 magnetometer.

The electromagnetic surveys indicated only one interesting zone of electrical conductivity on claim P. 48262. The zone consists of two weak conductors the axes of which appear to be related to a magnetic anomaly with a peak of 3550 gammas.

In December 1964, the properties were visited by a consulting mining geologist and magnetic, electromagnetic and

The magnetometer survey outlined 5 anomalies. The east-trending anomalies are interpreted to be due to ultramafic rocks or felsic metavolcanic rocks containing ironstone. The north-trending anomalies are interpreted to be due to diabase dikes.

During November 1961 to January 1962 the company collared 5 diamond drillholes in the claim area totalling about 1203 m. Holes Number C-1, C-2 and C3 were located in claim P. 48263 and holes Number C-4 and C-5 in claims P. 48262 and P. 48259 respectively. Drillholes Number C-1, C-2 and C-3 intersected wackes and intermediate tuffaceous rocks interlayered with ultramafic flows. Drillhole Number C-4 passed through intermediate metavolcanic flows and tuffs containing interbeds of wackes and cherty sulphidic ironstone. Drillhole Number C-5 intersected wackes and interlayered ultramafic rocks with minor intermediate tuffaceous layers.

The southeastern and northwestern parts of the area are underlain by mafic to ultramafic rocks which towards the centre of the area are overlain by intermediate to felsic metavolcanic rocks. The central parts of the claim area are underlain by wacke and siltstone intercalated with intermediate tuffaceous rocks.

There is no record of any further exploration work performed by the company in the claim area.

25. Hollinger Consolidated Gold Mines Limited [1962]

In 1962, Hollinger Consolidated Gold Mines Limited held 17 unsurveyed claims numbered P.46193, P.46195 - P.46205 inclusive, P.50103, P.51954 - P.15957 inclusive, in the northwestern corner of Thorneloe Township. There is no record of any previous exploration work performed in the claim area.

In April to May 1962, the company drilled 4 diamond drillholes with an aggregate length of about 1060 m. The drilling located the metavolcanic-metasedimentary contact in claims P.46201 and P.46197.

Outcrops in the area are scarce except for a few in the northwest corner of the township which consist of mafic massive and pillowed flows and related fragmental rocks intruded by late diabase dikes.

There is no record of any further exploration work in the claim area by the company.

26. Hollinger Consolidated Gold Mines Limited

In 1965, Hollinger Consolidated Gold Mines Limited held a group of 15 unsurveyed claims numbered P.74374 - P.74388 inclusive between Highway 101 and Star Lake. There is no record of any previous work within the claim area.

During the spring of 1965 ground magnetometer and electromagnetic surveys of the claim area were carried out. The purpose of the surveys was to locate the source of a large copper-nickel "float" found in the area which might have only been transported a short distance and the source of which might be easily detected by geophysical methods. The float is described as a dark gabbroic rock, uniformly mineralized with nickeliferous pyrrhotite and chalcopyrite.

The magnetometer survey outlined 3 anomalies which were due to the diabase dike outcrops in the area. The electromagnetic survey did not indicate any conductive zones that could represent graphite or sulphide mineralization to a depth of 60 m, within the claim area.

In the summer of the same year, a geological survey of the claim area was carried out by the company geologist. The area is underlain by light pink to grey coloured tonalite intruded by late quartz diabase dikes.

There are no records of any further exploration work within the claim area.

27. Hollinger Consolidated Gold Mines, Limited [1967]

Mahoney Creek Group

In 1961, Hollinger Consolidated Gold Mines, Limited held a group of 65 unsurveyed contiguous claims on both sides of Highway 101 between Mahoney Lake and Highway 101. The group contained 4 claims (P.50102 - P.50105 inclusive), in Thorneloe Township; 38 claims (P.50081 - P.50090 inclusive, P.50092 - P.50096, inclusive P.50106, P.50109, P.50113, P.50119, P.50120 and P.50122-P.50139 inclusive) in Denton Township; and 23 claims in adjoining Carscallen Township to the north. Exploration for gold was the primary purpose of staking these claims.

There is no record of any previous exploration work conducted in the area covered by the above claim group in Denton and Thorneloe Townships.

During 1961-62 the company conducted a ground magnetometer and electromagnetic survey of the entire claim group.

The magnetometer survey delineated 3 southwest trending anomalies. The most prominent anomaly varies from 300 m to 350 m in width and includes peaks up to 49,000 gammas near the northwestern and northeastern corners of Thorneloe and Denton Townships respectively. The anomaly was interpreted to be due to an ultramafic body. This interpretation however is not correct since mafic intrusive rocks have been mapped in outcrops that overlie the anomaly.

Another anomaly of moderate intensity extends southwest from the Bristol-Carscallen boundary on Highway 101 and terminates about 300 m north of a small lake, situated immediately east of Mahoney Creek, in the northeast section of Denton Township. Andesite outcrops are reported to be present over this anomaly in Carscallen Township. The third anomaly extends southwest from Carscallen Township and enters Denton Township on the east side of Mahoney Lake. Diamond drilling of this anomaly north of Highway 101 on the Carscallen-Denton Township line indicated that the anomaly is due to banded ironstone and intermediate to felsic metavolcanic rocks. Another drillhole further northeast in Carscallen Township intersected medium-grained andesite which contained some disseminated pyrite and pyrrhotite. Approximately north-trending isomagnetic contour patterns are most probably caused by diabase dikes.

The electromagnetic survey indicated 4 conductive zones. A fairly strong conductor is located northeast of Mahoney lake and corresponds with the third magnetic anomaly in Carscallen Township. Diamond drillholes M_1 and M_2 intersected graphitic slate containing nodular pyrite with some disseminated pyrite and pyrrhotite over a true length of about 15 m. The graphitic horizon is sandwiched between two narrow bands of fragmental volcanic rocks all enclosed in massive fine-grained andesite.

A fairly strong conductor is located a little further east of the previously mentioned conductor. Drillhole M3 intersected graphitic slates followed by intermediate tuff, all enclosed in fine-to coarse-grained andesite. Disseminated pyrite occurs in seams and nodules in the graphitic slates.

A moderately strong southwest-trending conductor with a corresponding magnetic anomaly is located at the Carscallen-Denton Township line. Diamond drillhole M4 with a total length of 138 m intersected interlayered rhyolite, quartz-sericite schist, ironstone and andesite. The ironstone contains 10 percent pyrrhotite with specks of chalcopyrite over a width of about 4 m. A moderately strong conductor in the southeast corner of Carscallen Township, north of Highway 101, intersected at a depth of 139 m chlorite-sericite schist, sericite schist with minor disseminated, barren pyrotite and pyrite, and graphitic wacke.

The magnetic anomaly in the northeastern corner of Denton Township did not show any conductive zone. However, a diamond drillhole about 331 m in length was collared in claim P.50096. The hole intersected about 300 m of fine-to coarse-grained serpentinized, occasionally brecciated, and strongly sheared ultramafic rock containing rare disseminated pyrite.

There is no further record of any further exploration work by the company in the area covered by the above claims.

28. Hollinger Mines Limited

Hollinger Mines Limited is the registered owner of 14 surveyed claims situated in east-central Denton Township. The claims are numbered P.45381-P.45382 inclusive, P.46790-P.46792 inclusive, P.48041, P.48042, P.48055, P.48056, P.48046, P.48047, P.48231 and P.48232. The claims are held under lease and are part of the original group of 23 contiguous claims staked by the company in 1965 under its previous title of Hollinger Consolidated Gold Mines Limited. The other 9 claims were numbered P.45380, P.46991 and P.90984-P.90990 inclusive. There is no record of any previous exploration work performed on the claim area.

The company in their exploration for gold, conducted ground electromagnetic and magnetometer surveys of the entire claim group in 1966-1967.

Out of four anomalies detected by the magnetometer survey 2 were interpreted to be due to ironstone and the other 2 to north and northwest-trending diabase dikes. A total of 12 conductive zones were delineated by the electromagnetic survey. Seven of the conductive zones were interpreted by the company geologist to be due to horizontal clay conductors, 4 due to graphitic layers in the sedimentary rocks, and 1, which coincides with a strong linear magnetic anomaly, due to ironstone containing abundant sulphides such as pyrrhotite or pyrite.

Although it was recommended that numerous conductive zones should be checked with a lower frequency Ronka Mark-4 electromagnetometer there is no record of any further geophysical exploration work in the claim area.

During September 1959 to August 1960, the company drilled 15 diamond drillholes with an aggregate length of about 1550 m in the claim area. The holes intersected interlayered intermediate to felsic tuff and ultramafic flows containing chert-sulphide and/or chert-magnetite-bearing iron formation and horizons of wacke and slate.

The claim area is underlain by mafic metavolcanic rocks in the south, metasediment in the north, and intermediate to felsic metavolcanics containing ironstone in the central part.

29. Hollinger Argus Limited

Hollinger Argus Limited holds 20 unsurveyed claims, (P. 568488 to P. 568507 inclusive) south of Highway 101 and southwest of Cripple Creek. Parts of the area were previously covered by Maridian Mining and Exploration Company Limited (34) and Dominion Gulf Company Limited (9) claims in 1972 and 1950 respectively.

In the spring of 1981, the present owner conducted a VLF electromagnetic survey over the entire claim area to examine gold occurrences associated with sheared lavas containing abundunt quartz-carbonate material.

Although many conductive zones were detected, only those labelled A to H are significant. Anomalies A,C,E and F are thought to be due to shear zones and/or sulphide mineralization. Anomalies D,G and H are believed to be due to subsurface topography. Anomaly B comprises three small conductors, which unlike other anomalies, run north-south. These anomalies are also associated with a magnetic high, and are presumed to be due to sulphides probably accompanied by magnetite.

There is thick overburden in the area. Limited outcrops within the area are of metasedimentary rocks and andesite tuffs on Cripple Creek; mafic to ultramafic volcanogenic metasedimentary rocks on both sides of the gravel road near the southern boundary of the property, mafic metavolcanics and related pyroclastic rocks in the center, and intermediate to felsic tuffs and metasedimentary rocks near the northern boundary of the claim group.

Samples taken from the mafic to ultramafic volcanogenic metasedimentary rocks are reported to contain trace amounts of gold (John Mountjoy, Personal Communication). One grab sample from a roadside outcrop of these rocks collected by the author, was found to contain 1000 ppm Ni and 1900 ppm Cr (analyses by the Geoscience Laboratories, Ontario Geological Survey, Toronto).

30. Jacomo Mines Limited [1975]

In 1975 Jacomo Mines Limited held 8 unsurveyed claims numbered P.371642 - P.371645 inclusive and P.372519 - P.372522 inclusive along the northern shore of Kenogamissi Lake in Thorneloe Township. The claim block was staked in May 1973 and overlapped southern parts of the property held by Maryland Gold Mines, Limited (34) and northern parts of the property held by Paymaster Consolidated Mines, Limited (39).

Trenching and stripping in the northern parts of the property were done by Joseph Thibeault before 1933. Hollinger Consolidated Gold Mines Limited drilled 14 diamond drill holes and George Derby drilled 8 diamond drill holes in the northern parts of the claim area in 1933 and 1939. In 1941 Maryland

Porcupine Mines Limited drilled 5 diamond drill holes. In 1946 the Maryland property was optioned by Coniagas Explorations Limited which deepened and wedged the holed drilled by Maryland Mines Limited (see Maryland Gold Mines Limited, 34). Sheridan Geophysics did an electromagnetic survey for Paymaster Consolidated Mines (39) in 1961 on the southern parts of the property and two short diamond drill holes were subsequently drilled to test a conductive zone. Ground magnetometer and electromagnetic surveys on the property were completed in April, 1974.

The magnetic survey delineated an east-trending anomaly with peaks up to 35,000 gammas. This anomaly was interpreted to be due to a steeply-dipping ironstone unit about 45 m wide. This zone was intersected by two drillholes in 1961. From the magnetic pattern the author interprets quartz-feldspar porphyry to run

along the north contact of the ironstone unit. The other magnetic features are interpreted to reflect the metasediment-metavolcanic contact and diabase dike.

The electromagnetic survey picked up three conductive zones two of which coincide with magnetic anomalies. Three diamond drillholes with a total length of 610 m were recommended for these two anomalies.

In April 1975 one diamond drillhole, which reached a maximum depth of about 195 m, was completed on claim P. 371642. The hole intersected about 168.6 m of quartz-feldspar porphyry, 26 m of fine andesite tuff interlayered with metasediments, and 1 m of fine-grained ultramafic rock altered to talc and serpentine. There is no record of any further exploration work recorded on these claims.

31. Jessie James Mines Limited (1964)

In 1964, Jessie James Mines Limited held 34 unsurveyed claims, in three groups, in the southern half of Keefer Township Group A consisting of 27 claims numbered P.75520 - P.75525 inclusive, P.80616 - P.80624 inclusive, P.80896 - P.80898 inclusive, P.81035 - P.81043 inclusive, was located west of Shy Lake; group B consisting of six claims numbered P.57803, P.57804 and P.65968 - P.65972 inclusive was located overlapping Highway 101 near the eastern township-boundary; and group C of one claim numbered P. 57801 was located about 800 m south of group B. geological surveys of Group A together with some diamond drilling was suggested. However, there is no record to show whether the work was completed.

Group A is underlain by metavolcanic rocks consisting of porphyritic massive flows and pyroclastic rocks of intermediate composition and medium-grained intermediate to felsic intrusive rocks. Group B is underlain entirely by granitic rocks while group C is underlain by the granitic-metavolcanic contact.

32. Jowsey Denton Gold Mines Limited [1938]

W.D. Harding and L.G. Berry (1938) described the property held by Jowsey Denton Gold Mines Limited as follows:

> "Jowsey Denton Gold Mines, Limited, holds 14 claims in Denton township. The group is situated on Cripple creek

south of Carlton lake and includes the following 7 surveyed claims: P. 643,644, 825, 18,885-18,887, 19,653. Gold was discovered in this section by Terry Carlton, who staked the claims in 1910. The rocks consist chiefly of massive greenstones intruded by granite and diabase dikes. A narrow band of iron formation and some volcanic fragmentals are also exposed.

On claim P. 643 a shear zone about 8 feet wide and 100 feet long strikes approximately N. 30°E. in massive greenstone. The zone is heavily mineralized with pyrite, and gold has been panned from crushed and roasted vein material. In the early days a small shaft was sunk on the zone by Terry Carlton. Diamond-drilling was done on the zone in 1935. Erratic gold values are said to have been obtained.

On claim P. 644 a shear zone in the granite strikes approximately N. 25°E. Terry Carlton also sank a small shaft on this showing. The sheared rock is mineralized with pyrite and a little chalcopyrite. Seven holes drilled into the zone intersected mineralized material. Erratic gold values are said to have been obtained."

There is no further record of any exploration work in the claim area by the company.

33. Maridian Mining and Exploration Company Limited [1974]

In 1973, Meridian Mining and Exploration Company Limited held a group of 56 unsurveyed claims (P.326363, P.326364, P. 327452 - P.327481 inclusive, P.354403 - P.354420 inclusive, P.

354005, P.354006, P.326359 - P.326361 inclusive and P.354543) situated in the northern half of Denton Township south of Highway 101.

In 1972, ground magnetometer and electromagnetic surveys of the claim area were carried out. The most prominent magnetic anomaly occurs near the old gold showings along Mahoney Creek in claim P.327465 and coincides with outcrops of mafic intrusions in the area. Scattered magnetic highs occur in other parts of the western portion of the property particularly in claims P.354406, P.354415, P.354416, P.354413 and P.326360. Many of these small anomalies may represent, small isolated ironstone units in the metavolcanic and metasedimentary rocks, and north-striking diabase dikes.

No electromagnetic anomalies were picked up during the survey. The only electromagnetic anomaly that coincided with a magnetic anomaly occurs in the southeast corner of claim P. 354415 and is due to mafic metavolcanic rocks. Several other weak anomalies occur in the area, but do not coincide with any significant magnetic anomalies.

In the summer of 1974, four diamond drillholes totalling about 126.5 m in length were collared in the gold showings on the east bank of Mahoney Creek in claim P.326363. The holes intersected ultramafic and mafic metavolcanics containing at intervals abundant pyrite cubes. Drilling records do not show any assay results.

The claim area is underlain by metavolcanic and metasedimentary rocks which strike N70°E to N90°E. The metavolcanics consist of ultramafic to mafic flows, pillowed flows together with related breccia, pyroclastic rocks; and intermediate flows and tuffaceous rocks. The metasedimentary rocks dominantly consist of wacke and siltstone with minor polymictic conglomerate. The whole supracrustal sequence is isoclinally folded with a steeply dipping axial plane trace and an easterly plunging fold axis. Late diabase dikes intrude the metavolcanic-metasedimentary rocks.

34. Maryland Gold Mines Limited (1946)

In 1946, Maryland Gold Mines Limited held 10 patented claims numbered P.7538, P.7556, P.7557, P.8218, P.18590 - P.18592 inclusive, P. 18564 - P.18566 inclusive, in the northeast part of Thorneloe Township west of Wawaitin Falls. The claim area was primarily acquired to explore for possible gold mineralization.

History:

The property originally included the Thibeault claims with two shafts of 34 and 3 m deep. In 1933 the property was optioned and drilled by Hollinger Consolidated Gold Mines Limited who put down 14 diamond drill holes, with an aggregate length of 900 m, in the northern part of the claim group.

In 1939 George Derby drilled 8 diamond drillholes with an aggregate length of 2027 m in the southern part of the property. Hogg (1946 Resident Geologists Files, Timmins) described the work.

> "The Derby drilling was done farther south and the holes were collared either in the sedimentary shear zone, or south of it. This drilling outlined a body of granite and grey

porphyry lying south of the sediments. The granite is a coarse textured, grey to green type with considerable alteration in the feldspars. The grey porphyry is probably an altered sediment and varies from a good porphyry with large, white phenocrysts, to a dense, grey rock including short lenses of dark schist.

In Hole No. 4, south-west of the old shaft, good values were reported in the grey porphyry over a width of some 30 to 40 feet. In this section a couple of narrow seams about an inch wide carry heavy pyrite, and the remainder has scattered grains of pyrite.

In Hole No. 3, about 150 feet west of No. 4 a section of 15 feet in a coarse porphyry dyke, was also reported by H.B. Hatch to carry fair values. This rock is not similar to the intersection in Hole No. 4, and would be considerably farther south.

Hole No. 7 was a deep hole, started farther to the west, and it flattened considerably before ending at a depth of over 1000 feet. It passed through the granite and porphyry and back into sediments."

General Geology

The property is almost entirely covered by glacial deposits. The limited outcrop and drillhole data, however, indicate that the northern portion of the property is underlain by metasedimentary rocks consisting of conglomerate, wacke, and siltstone that have been metamorphosed and altered to chlorite-quartz-albite, feldspar-chlorite, quartz-sericite, and carbonate chlorite-fuchsite schists. Locally these metasediments are strongly sheared and contain pyrite. An altered quartz-feldspar porphyry intrusion is in contact with the metasedimentary rocks to the south.

Three east-trending shear zones about 1 m in average width and containing lenticular quartz veins were located in the vicinity of this metasedimentary-quartz-feldspar porphyry contact. Gold occurrences accompanied by galena and pyrite mineralization were reported from these veins.

In 1941 Maryland Porcupine Mines Limited drilled 5 diamond drill holes on the property. Drill hole data for only 2 holes are available. Hole No. 4 (location not given) is about 305 m in length and intersected quartz-feldspar porphyry except for about 3 m of wacke. Hole No. 5 about 222 m long, located in claim P. 18566 passed through 88 m of wacke and carbonate schist and 134 m of conglomerates.

In 1946 the property was optioned by Coniagas Exploration Limited and an attempt was made to check previously reported gold values by wedging previously drilled holes. Results of the wedging were inconclusive. However, the drilling records indicate that Hole No. 4 of Maryland Gold Mines Limited was wedged and drilled to a total length of about 292 m. Coniagas Explorations Limited Hole No. 1 drilled about 46 m west of Maryland Gold Mines Limited Hole No. 3 passed through the porphyry into amygdaloidal andesitic metavolcanic rocks about 165 m down the hole. Coniagas Explorations Limited Hole No. 2 was the only hole that passed from the shear zone within the metasedimentary rocks into porphyry to the south. It was about 165 m in length and passed through about 9 m of massive conglomerate before entering the porphyry.

There is no further record of any exploration work on the property.

35. McCoshen [1938]

W.D. Harding and L.G. Berry (1938) described the McCoshen property as follows:

> "The McCoshen Group consists of several unsurveyed claims situated in the central part of the township. The rocks consist of highly schisted and drag-folded greenstones and tuffs. Stripping and trenching on the western part of the group has uncovered small irregular quartz veins in the drag-folded schist. Both the veins and the schist carry pyrite. The claims were optioned in 1937 to Goldale Mines, Limited. Samples taken by the company are said to have yielded erratic gold values."

There are no records to show and further work on the claim group.

36. Mill Hill Mines Limited [1973]

In 1972, Mill Hill Mines Limited held a group of 21 unsurveyed claims overlapping the adjoining corners of Denton, Thorneloe, Carscallen and Bristol Townships. Four claims, numbered 354908-354911 inclusive, were located in Denton Township. Another four claims, numbered 354912-354915 inclusive, were located in Thorneloe Township. The rest of the claims were located in Carscallen and Bristol Townships. From 1961-1967 the claims in Denton Township and half of the claims in Thorneloe Township were held by Hollinger Consolidated Gold Mines Limited (27).

Gold was the only commodity sought by Mill Hill Mines Limited. To locate any gold-bearing conductive shear zones the company, in the spring of 1973, conducted ground magnetometer and elctromagnetometer surveys of the entire claim group.

The magnetic survey showed results similar to those reported by Hollinger Consolidated Gold Mines Limited (1961-1967). The area in the northwest and southeast corners of Thorneloe and Denton Townships, are underlain by mafic metavolcanic rocks cut by a north-trending fault. Towards the north, in Bristol and Carscallen Townships intermediate metavolcanic rocks are intruded by diabase dikes.

The electromagnetic survey detected 8 southwest-to west-striking conducters that vary in length from a few tens of meters to over 61 m. The five stronger conductors are situated within mafic metavolcanic rocks in Denton and Thorneloe Townships. Three conducters of rather weak and variable strength are located in Bristol and Carscallen Townships.

Some trenching and about 457 m of diamond drilling were planned as a second stage followup but there are no records to show whether the work was completed.

The claim area is largely covered by Cenozoic deposits of sand, clay and till cover. The bedrock in the area consists of metavolcanics and metasediments. The metavolcanics are mainly mafic massive to pillowed flows and related breccia with minor mafic intrusive rocks. The eastern part of the claim area in Thorneloe Township is underlain by metasedimentary rocks consisting of wacke and siltstone.

37. Moore [1933]

W.D. Harding and L.G. Berry (1938) described the property held by Moore as follows:

> "The Moore group consists of 22 unsurveyed claims in the southwestern corner of Keefer township. The rocks consist of Keewatin greenstones and acid tuffs, which have been intruded by granite, aplite, quartz-feldspar porphyry, and diabase. The strike of the greenstones varies from N. 45°E. to east. They dip almost vertically. Stripping and trenching has disclosed a vein zone 2 to 5 feet in width in greenstone. It has been followed along the strike for over 150 feet. The zone contains two folded quartz veins, which range in width from 6 inches to 18 inches and conform to a northeastward-pitching drag fold in the greenstone. The veins carry a little pyrite, chalcopyrite, and galena. Gold values are reported to have been obtained. Diamond-drilling done in 1933 failed to locate an important ore body."

There are no records of any further exploration work on the property.

38. O'Neill B. [1938]

W.D. Harding and L.G. Berry (1938) described the O'Neill property as follows:

> "Barry O'Neill, of Ottawa, holds about 60 claims in the northern part of Thorneloe township. These claims are

situated both east and west of the Tatachikapika river and are part of a large group that extends north into Bristol township. All the claims in this group were staked in 1937. Rock outcrops are rare, but lavas, sediments, and diabase dikes are exposed. Operations during the early part of the summer of 1937 were confined largely to claim P. 23,886, where exposures of Timiskaming sediments occur along the Tatachikapika river. Work had been done in this vicinity in former years by previous stakers, and during 1937 some of the old showings were re-examined. The mineralization, which occurs in quartz veins and in the altered sediments, consists mostly of pyrite. Later in 1937 trenching was done in the northern section of Thorneloe township west of the Tatachikapika river."

There is no record of any further work conducted on the claim group area.

39. Paymaster Consolidated Mines Limited [1962]

In 1960 Paymaster Consolidated Mines Limited held a group of 9 unsurveyed claims (P. 49816-P. 49818 inclusive, and P. 49786-P. 49791 inclusive) in Thorneloe Township, about 100 m southwest of the Hydro Dam at Wawaitan Falls. The northern part of the property partially overlapped the southern claims (P. 18564-P. 18566 inclusive) of Maryland Consolidated Gold Mines Limited (33). There are no records to show any previous exploration work in the claim area. The company's main interest in the area was exploration for gold.

In March 1961 a detailed electromagnetic survey by the company was done to more accurately locate a conductor found by a reconnaissance electromagnetic survey conducted prior to claim staking by the company. The same east-striking conductor was found in the center of the claim area as was found in the reconnaissance survey.

The conductor was interpreted to be caused by either ironstone or a graphitic sulphide-bearing zone.

Two diamond drillholes, recommended to test the cause of the conductive zone, were completed in February 1962. Hole Number S-1 intersected about 33.3 m of fine-grained, dark-green highly altered andesite and about 13 m of metasedimentary rocks containing thinly bedded lean ironstone; light grey to white highly siliceous chert, and local graphite-rich bands containing segregations of pyrite and pyrrhotite. Five core samples that were assayed returned only trace amounts of gold. The second hole, S-2, which was located further southwest, of hole S-1, passed through 24.85 m of light-grey, highly siliceous metasedimentary rocks which contain graphite and sulphide-rich layers, and about 28 m of soft, locally magnetic, massive peridotite. The 4 core samples assayed by the company returned only trace amounts of gold.

40. Paymaster Consolidated Mines Limited [1962]

In 1962, Paymaster Consolidated Mines Limited held a group of 14 unsurveyed claims (P. 49741-P. 49754 inclusive) located southwest of Godon Lake and partially overlapping the former Phillip claims.

The company conducted an electromagnetic survey of the entire claim area, to locate the presence of possible gold-bearing conductive zones. The survey outlined 3 conductive zones which were interpreted by the company as: Conductor 'A' which occurs near the central part of the property was interpreted to be due to a 'wet' shear zone without any mineralization and, Conductors 'B' and 'C' near the east end and north part of the property respectively were interpreted to be due to graphitic layers.

The claim area is underlain by massive (flows?) to pyroclastic andesitic rocks that have been transformed to chlorite and sericite-carbonate schists within the shear zones.

41. Phillip A.E.[1947]

In 1946 A. Phillip held a group of 23 claims P. 24391, P. 24448 - P.24449 inclusive, P.29401 - P.29407 inclusive, P.30278, P.30279, P.34221, P.34222 and P.34682) overlapping the southern end of Godon Lake in Denton Township. The property partially included the Thomas Dodds claims (8).

Extensive stripping and trenching in the metavolcanics exposed a series of shear zones, some of them containing quartz or quartz-carbonate veins containing pyrite and chalcopyrite mineralization. Samples from all the trenches and pits are reported to have assayed up to 0.03 ounces of gold per ton. Five channel samples cut across the main pit did not return encouraging results.

In October 1947, 2 diamond drill holes with a total length of 257 m were collared in claim P. 29404. The drill holes intersected sheared andesite, chlorite-carbonate schist and coarse-grained diorite along their entire length with some pyrite and chalcopyrite mineralization in quartz-carbonate veins.

There is no record of any further work completed in the claim area by the owner.

In 1938 A. Phillip also had a property in Thorneloe Township. W.D. Harding and L.G. Berry (1938) described the property as follows:

> "The A.E. Phillips group of 9 unsurveyed claims lies between the J. Thibeault group and the Tatachikapika river. There are few rock outcrops. Sheared mineralized conglomerate containing quartz stringers is exposed along the trail leading to Wawaitin Falls. The outcrops are near the river. The beds in this section strike N.70°W and dip almost vertically. A pit at this location has disclosed pyrite mineralization in the highly altered sediments."

There is no record of any further work completed on the claim area.

42. Porcupine Quartet Gold Syndicate [1936]

W.D. Harding and L.G. Berry (1938) described the Porcupine Quartet Gold Syndicate property as follows:

> "The Porcupine Quartet Gold Syndicate holds a group of 13 unsurveyed claims. Eleven of these are situated in the northern part of Denton township on the east shore of Carlton lake. The remaining two claims of the group lie in the southern part of Carscallen township. Most of the claims were staked by Alex. Stuart. The rocks consist of

granite and northwestward-striking porphyry dikes. The dikes have a maximum width of 80 feet and in a few places contain visible quartz phenocrysts. In thin section, they show phenocrysts of altered orthoclase and acid plagioclase, chlorite, and calcite.

"On the most northern claim of the group, in Carscallen township, a strong shear zone, striking about N. 20°E., cuts across a porphyry dike into the surrounding granite, but the shearing is less pronounced in the granite wall rock. The zone is well mineralized with pyrite. A picked sample obtained by the writer yielded a high gold value. It is reported that extensive bulk and channel sampling done in 1936 indicated that the gold values are generally low.

Six chains south of the township line in Denton a shear zone 10 feet wide and 100 feet long strikes N. 20°E. in the granite. It was described by Hawley[1] as showing "a complete gradation from altered massive biotite granite to sericite schist with eyes of blue quartz." The zone is well mineralized with pyrite and is intruded by a lamprophyre dike one foot in width. Low gold values were reported from extensive channel and bulk sampling done in 1936."

There is no record to show any further exploration work performed on the property.

43. Pyke, D.R.

D.R. Pyke holds two groups of 9 unsurveyed claims, group one (P.568441, and P.595028 to P.595032 inclusive) located west of Wawaitin Falls; and group two (P.568444, P.568445 and P.596000) situated to the east of Wawaitin Falls in Thorneloe Township. The western claims were part of the Thibeault claims (54) prior to 1939.

The present owner conducted a program of overburden drilling. A total of 16 holes with an aggregate length of 40.1 m was completed. The objective was to sample bedrock and the glacial sediments immediately overlying the bedrock called "lodgement till" or "modified till" depending upon their nature. D.R. Pyke (1981; Assessment File 2.4238, Toronto) described the nature of these till-types as:

> "Lodgement till in the general Timmins area consists of very compact light to dark grey rock debris which is "pasted" onto the bedrock surface. It comprises a wide spectrum of clast sizes, most of which are locally derived. Armoured clasts and mould and cast features are common. Lodgement till best reflects the chemical composition of bedrock in the immediate area up-ice.
>
> Modified till is compositionally similar to lodgement till but is not compact. Mould and cast features are absent and armoured clasts are few. It appears to be till that has been slightly modified by frost action and/or fluidization. Although modified it still reflects accurately the chemical make-up of its nearby source up-ice."

The overburden drilling indicated that lodgement and modified tills suitable for geochemical sampling are scarce in the property as they have been reworked and destroyed by later melt waters. The overburden which now consists predominantly of layered strata of sands, gravels and silts cannot be used effectively in evaluating the bedrock potential. Because of the relatively shallow overburden depths, most of the drilling was concentrated on obtaining samples of bedrock. Out of 16 only 7 holes reached bedrock that consists of dark brown metavolcanic rocks. Outcrops exposed by pitting and trenching by the claim holder and outcrops located about 300 m east on the Mattagami River indicate that the area is underlain by metasedimentary rocks which consist of conglomerates and wacke rather than metavolcanic rocks though some of the clasts and matrix are volcanic in origin.

Thorneloe East Property:

In 1938, claims P.596000 and P.568444 of the Thorneloe East Property were a part of the Derby East Group (7) and P. 568445 a part of the Swanson Group (51). There is no record of any exploration work ever performed on these claims.

The present owner carried out soil sampling in August 1980. A total of 71 samples of humus A-horizon were collected and hang--dried. The samples were analysed for gold (parts per billion) and arsenic (parts per million) by X-Ray Assay Laboratories. Plots of the results indicated 4 areas of very low gold concentration in the humus horizon, varying from less than 10 ppb to 12 ppb. Arsenic contents that vary from 1 to 6 ppm in the humus did not define any anomalous areas.

The survey results indicate that either the trees do not tap the bedrock source due to thick overburden or there is no gold in the underlying bedrock of the area surveyed. It is also possible that samples were too widely spaced. However, it was recommended (Pyke, assessment file 2-4237) that the humus sampling be extended further south to include the carbonatized horizon within the metasedimentary sequence.

44. Reid S. [1938]

W.D. Harding and L.G. Berry (1938) described the Sam Reid group of claims as follows:

> "The Sam Reid group consists of approximately 19 claims situated in the central part of Denton Township one to two miles northwest of the mouth of Cripple Creek. Slates, greywackes, and conglomerate are exposed in the middle of this group. These sediments strike about W70°E and dip steeply to the southeast. North of the sediments there are lavas containing flow breccias. South of the sediments there are white banded tuffs and massive pillow lavas. The sediments have been severely schisted. One band of greywacke, which has been carbonatized and impregnated with pyrite, carries low gold values. About 3,000 feet of diamond-drilling was done in the spring of 1936, but no important ore bodies were indicated. A short distance east of this group, heavily carbonatized greywackes and slates are exposed. A small irregular quartz vein carrying pyrite cuts pyritized greywacke. A grab sample of the best-looking material yielded a trace of gold."

There is no record of any further exploration work completed on the claim group.

45. Reid S. [1938]

W.D. Harding and L.G. Berry (1938) described the Sam Reid group of claims in Keefer Township as follows:

> "The Sam Reid group of 10 claims is situated in the southern part of Keefer township just west of Boom (Raft) lake. The rocks consist of drag-folded greenstone and banded tuffs, which, in the southern part of the group, have been intruded by granite. Stripping and trenching have uncovered a few small quartz veins, which conform to drag folds in the greenstone. The veins are sparsely mineralized with sulphides. Pyrrhotite mineralization has been disclosed in the greenstones at a place situated about 2 chains north of the granite contact."

There is no record to show any further work completed on the claim group.

46. Scott [1938]

W.D. Harding and L.G. Berry (1938) described the Scott property as follows:

> "The Scott group consists of 5 unsurveyed claims, P. 10,767-10,771. The rocks consist of highly schisted and contorted lavas and tuffs, which have been intruded by granite and diabase dikes. The general strike is east and west, but minor folds are so numerous that there is considerable variation from the direction. Numerous drag folds pitching east indicate a syncline to the north. Near the granite the strike follows that of the contact. Surface workings have exposed a number of small quartz veins in rusty-weathering carbonated lavas."

The claims were located north of Godon Lake. There is no record to show any further exploration work on the claim group.

47. Sheehan P. [1938]

W.D. Harding and L.G. Berry (1938) described the Phillip Sheehan property as follows:

> "The Phillip Sheehan holdings consist of 9 unsurveyed claims situated at the north end of Godon lake. The rocks consist of strongly schisted greenstones and tuffs intruded in the northwestern and southeastern sections by granite. These rocks are cut by diabase dikes. A shear zone 12 feet wide and 75 feet long occurs in the granite lying east of Godon lake. This zone strikes N.35°W. and dips vertically. It contains an irregular quartz vein, which carries pyrite and purple carbonate. The vein is said to yield traces of gold. In 1937 the group was optioned to the Verity Porcupine Gold Mines, Limited."

There are no records of any further exploration work performed.

48. Simpson-Marcot [1938]

W.D. Harding and L.G. Berry (1938) described the Simpson-Marcot holdings as follows:

> "The Simpson-Marcot holdings consist of 13 unsurveyed claims in the southeastern part of Keefer township 11/2 miles east of Warren lake. The rocks consist chiefly of massive green lavas, which locally contain pillow structures. Trenching and stripping in 1935 and 1936 uncovered a small quartz vein in a shear zone, which strikes

N. 75°W. and dips northeastward. Pyrite, magnetite, and chalcopyrite are visible in the shear zone. Low gold values have been reported."

There is no record to show any further work completed on the claim group.

49. Schnubb E. [1938]

W.D. Harding and L.G. Berry (1938) described the Schnubb property as follows:

> "E. Schnubb holds a group of three claims, H.S. 983, H.S. 984, and H.S. 987, situated on the east shore of the Mattagami river north of the Wawaitin dam. Mineralized quartz veins and stringers have been exposed in pits on the shore."

There is no record of any further work completed on the claim group.

50. Sturgex Mines Limited [1972]

In 1972 Sturgex Mines Limited held a group of 21 unsurveyed claims overlapping Opishing Lake near the western boundary of Keefer Township. The claims were numbered P.318721 - P.318726 inclusive and P.327677 - P.327691 inclusive.

There is no record to indicate whether any exploration work was ever completed on the claim area.

51. Swanson A. [1940]

In 1938, A. Swanson held a group of four surveyed claims numbered W.D. 732, P.22794, P.22795, and T.R.P. 24248 located east of the Mattagami River at Wawaitin Falls. In 1940 the claim group was known as the English-Swanson Property.

A small amount of trenching on claims P. 22795 and W.D. 732 was done in 1938 which exposed metasedimentary rocks consisting of conglomerate and wacke with some slate. These sediments strike N70°W and dip 65° to 70°N. The trenching exposed a highly carbonatized and chloritized zone about 12 m in width carrying quartz stringers with pyrite mineralization. Blasting was done in one trench and samples assayed showed only trace amounts of gold.

Further trenching, on the claim line between claims P. 22794 and P. 22795, in 1940 exposed about an 18 m width of sheared wacke containing green carbonate and quartz stringers. The shear zone was strongly mineralized and consisted of finely crystalline, well disseminated pyrite. Assays of samples from one trench, however, showed only trace amounts of gold. There are no records to show any further work on the claim group.

52. Texas Gulf Sulpher Company Incorporated [1971]

In 1971, Texas Gulf Sulpher Company held 44 unsurveyed claims in the northeast quarter of Keefer Township. The claims were numbered P.256396 - P.256404 inclusive, P.325906 - P.325910 inclusive, P.325940 - P.325951 inclusive, P.326088 - P.326097 inclusive, and P.326102 - P.326107 inclusive. These claims also included the Galata claims (14) which were optioned by the company.

The company in a joint venture with Conwest Exploration Company Limited conducted an airborne electromagnetic survey of the northeast quarter of the township. No significant results were obtained by either company.

In September, 1971 the company collared 3 diamond drillholes totalling about 258 m in claim P. 325907 near the eastern boundary of Keefer Township. The holes intersected andesite, rhyodacite and felsic to intermediate tuffaceous rocks.

The claim area is underlain by felsic to intermediate metavolcanic rocks containing some interlayered mafic metavolcanic and metasedimentary rocks.

53. Texasgulf Canada Limited

Texasgulf Canada Limited holds 57 unsurveyed claims covering the area over the common corners of Bristol, Carscallen, Denton, and Thorneloe Townships. In Denton Township the 9 claims are P.528256 to P.528261 inclusive and P.528263 to P.528265 inclusive and 2 claims in Thorneloe Township are P.528255 and P.528262. This area was previously held by Hollinger Consolidated Gold Mines Limited (27) and Hill Mill Mines Limited (36).

The present company is looking for gold in the area. To locate conductive zones a combined airborne electromagnetic and magnetic survey was flown in May 1981.

No conductive zones were located in the claims situated in Denton and Thorneloe Townships. The magnetic survey, however, confirms that the lithologic units in the area trend northeast. A program of overburden drilling based on a geological interpretation of geophysical data was recommended.

54. Thibeault, Y.

The Thibeault claims are located west of Wawaitin Falls and originally consisted of 9 patented claims; numbered P.7538; P. 7556, P.7557, P.8218, P.18336, P.18337, and P.17993-P.17995 inclusive, and thirteen unsurveyed claims, numbered P.18557, P. 18564 - P.18566 inclusive, P.18590 - P.18592 inclusive, P. 18598 - P.18600 inclusive, P.22430, P.24949, and P.19715 inclusive. The property is described by W.D. Harding and L.G. Berry (1939) as follows:

"Joseph Thibeault holds two groups of claims in Thorneloe township. One group of 10 claims lies between the Wawaitin dam and the Tatachikapika river. Another group of 12 claims lies between the flooded ground immediately south of the Wawaitin dam and the east boundary of Thorneloe. Most work has been done on the first-mentioned group. In that section claims were staked as early as 1909. Thibeault's first staking was done in 1916. Since then other claims have been acquired, and in 1937 the group consisted of 10 claims, including the four patented claims P. 7,556, 7,538, 7557, and 8,218."

Work on this group has been confined largely to gold-bearing quartz veins in schisted conglomerate near the boundary between claims P.7,538 and 7,556. In 1917, a small boiler was installed and a shaft was sunk to a depth of 28 feet in quartz and schist on claim P. 7,556. In the same year another shaft was commenced on a gold-bearing quartz vein a little farther west on claim P. 7,538. In the summer of 1937, this shaft, which was said to be 40 feet deep, was filled with water, but gold was visible in the vein a few feet west on claim P.7,538.

The vein minerals consist mostly of quartz with small amounts of calcite, ankerite, pyrite, galena, and some gold. In 1933 the group was optioned by Hollinger Consolidated Gold Mines, Limited, and 14 holes were drilled to intersect the shear zone in the conglomerate which contains the gold-bearing quartz veins. Altogether about 3,000 feet of diamond-drilling was completed. The results did not justify further work, and the option was not exercised. In 1934, a 5-ton mill was installed, and a small amount of gold has since been recovered.

The rocks in the other Thibeault group are covered with overburden and apart from the assessment requirements no work has been undertaken."

The patentted claim group is underlain by conglomerate, slate, and wacke intruded by quartz veins and feldspar porphyry. The general trend of the metasedimentary rocks is west to N60°W. The shearing is parallel, or very nearly so, to the bedding. The fracture cleavage in the slates indicates that the metasedimentary rocks lie on the south limb of an east-trending syncline with an unknown east plunge.

55. Thompson C.

Mrs. C. Thompson holds 6 patented claims numbered P.22841, P.25078, P.25079, P.26781, P.26782 and P.27871 near the eastern boundary of Keefer Township. There is no record of any exploration work performed on these claims.

56. Verity Porcupine Gold Mines Limited [1938]

In 1938, Verity Porcupine Gold Mines, Limited held a group of 46 unsurveyed claims located chiefly in the northwestern part of Price Township. The group included 6 claims numbered P. 23143-P. 23148 inclusive, in Thorneloe Township which are entirely covered by sand and swamp. Judging from the bedding trend of the metasedimentary rocks in the Thibeault and Swanson showings, they are thought to continue into the area covered by the Verity Porcupine Gold Mines Limited claims in Thorneloe Township. No showings of interest have been uncovered in this group although a carbonatized zone in the metasedimentary rocks was found in Price Township.

57. Vizina A. [1938]

In 1938, A. Vizina held a group of claims described by W.D. Harding and L.G. Berry as follows:

> "A. Vizina holds 9 claims in one group situated on the west bank Mattagami river at Wawaitin falls. Five claims of this group, H.S. 969-971, 973, and 974, have been surveyed. The rocks consist of conglomerates, greywackes, and slates, which are cut by quartz veins. Most of the exposed rock lies along the shore of the river. The work done consists of pits and trenches. Low gold values have been reported from pyrite-bearing quartz veins."

There is no record of any further work done on the claim group after 1938.

58. Wakemac Denton Gold Mines Limited [1945]

The Wakemac Denton Gold Mines Limited holdings constituted a group of 25 unsurveyed claims numbered P.10767 - P.10771 inclusive, P.20283, P.22515 - P.22517 inclusive, P.22665, P. 22666, P.22896 - P.22898 inclusive, P.27712 - P.27714 inclusive, P.28436 - P.28439 inclusive, P.28444, P.28445, P.28944 and P. 28945, in the west-central part of Denton Township.

It is not known whether the claims were restaked or bought from the previous owners, however, they were acquired to investigate two zones of pronounced shearing on which only a limited amount of surface work had been done in the past and which appeared to warrent further exploration.

On claim P.22517 at least 11 trenches, varying from 2.8 m to 34.25 m in length and 1.2 m to 6 m in width existed (likely completed by the previous owner) on a mineralized shear zone in schistose intermediate metavolcanic rocks. W. Jewett describes the occurrence as follows:

> "The gold occurs associated with sulphides and arsenides in quartz filled fracture and drag fold veins and also in the disiminated sulphides of the country rock. I understand values as high as fifty dollars were obtained on the surface over mineable widths. Channel samples after blasting gave values from trace to 0.32 oz. per ton over widths varying from four to twenty feet."

Wakemac Denton Gold Mines Limited carried out further trenching and pitting on the McCoshen Shear in claims P.20283 and P.22517, and the "Scott Shear" which extends from approximately the center of claim P.10769 to the northwest corner of claim P. 10768. From February to July 1945 12 holes were drilled on the property totalling about 1296 m in length. Seven of the holes numbered 1 to 4, 9, 10 and 11 totalling about 700 m were drilled to systematically explore the northeasterly trending "McCoshen Shear."

The drilling on the "McCoshen Shear" covered an overall length of 305 m. The true width of the shear zone as indicated by drilling is approximately 61 m. Within the main zone of shearing there are highly schistose sections containing from 10 to 20 percent quartz-carbonate veining which do not show any definite structural control. Core samples indicate that gold values are associated with arsenopyrite; the pyritic material is practically barren of gold. According to Fockler if the narrow intersections of vein material carrying arsenopyrite, are correlated between holes 1, 2 and 3, they define a gold bearing streak striking about N50°E at a slight divergence to the trend of the main shearing. Of a total of 90 samples, (cores and sludges combined) submitted for assay from the McCoshen Shear, only 5 samples returned traces of gold.

Hole Number 1 which was drilled under the main showing carrying high gold values in the range of 0.08 to 1.04 ounces of gold per ton, encountered a shear zone with quartz veins from the casing to 57 m. A 0.85 m section from 30.15 m to 31 m, well barren stringers and lenses of vein quartz the shearings contain no large-scale development of vein material and, similar to the McCoshen Shear, the Scott Shear, appear to be broad in extent and does not contain any gold concentrations. From hole 5 thirteen sludges taken down to 46 m gave no gold values. The sludges from 6 m to 12 m from hole 6 gave 0.02 ounces gold per ton. In hole Number 7, 5 core samples from 48.8 m to 55 m containing about 40 percent vein quartz, and sludges from 22.5 m to 28 m with about 40 percent blue-white quartz, returned no gold values.

Hole Number 8 intersected metavolcanic rocks. Eighteen sludge samples taken throughout the section of metavolcanic rocks returned trace to nil gold values.

Hole Number 12 traversed felsic tuffs with numerous sections of cherty material carrying fine disseminated pyrite and pyrrhotite. A number of core samples (exact figure not given) and 47 sludge samples indicated nil to trace amounts of gold.

The claim area is underlain by metavolcanic and metasedimentary rocks consisting of intermediate to felsic tuff and flows to the north; wacke, mafic to intermediate flows and pyroclastic rocks near the center; and ultramafic flows and volcanogenic material derived from erosion of the ultramafic to mafic rocks to the south. Near the south and northern boundary of the claim area felsic intrusive rocks intrude the metavolcanics and the latter is metamorphosed to the amphibolite facies rank. The youngest rocks in the area are approximately north-trending diabase dikes which intrude both the supracrustal and granitic rocks.

59. Whitmarsh B. [1977]

In 1977, B. Whitmarsh held a group of 4 unsurveyed claims numbered P.444339 - P.444342 inclusive near the northern edge of Boom Lake. A total of 4 trenches were dug on claim P. 444339 in the summer of 1977. There is no record of any further work performed on the claim area.

The bedrock in the claim area consists of pink to grey coloured foliated to gneissic granite which is intruded by massive to occasionally foliated, medium-grained quartz diorite. Diabase dikes intrude both granitic and quartz dioritic rocks.

SUGGESTIONS FOR FURTHER EXPLORATION

In the Porcupine Camp past and present producing gold mines are located on quartz-carbonate veins in shear zones in the metavolcanic and metasedimentary rocks. Similar shear zones also occur in the map-area specifically in the vicinity of Godon Lake in Denton Township and west of Wawaitin Falls in Thorneloe Township.

Reasonably good gold and silver values are reported from a quartz vein in intermediate metavolcanic rocks near the contact with the felsic intrusive rocks on the Bartleman Estate in Keefer Township (see Bartleman Estate, List of Properties, this report). More than 45,000 tons of ore, grading an average of 0.21 ounces per ton, is reported to be present at the Auno Porcupine Property (see Auno Porcupine Gold Mines Limited, List of Properties, this report). The deposit is located in three separate shear zones near the contact of metavolcanics and felsic intrusive rocks.

A few good gold values in ultramafic rock are reported from the Gowest Gold Resources Limited (see Gowest Gold Resources Limited, List of Properties, this report) stripping on Mahoney Creek. Drilling of this mineralized zone has been unsuccessful.

It is suggested that the contact between the metavolcanic-metasedimentary sequence and the felsic intrusive rocks be further explored by means of geophysical surveys and diamond drilling and stripping where possible.

The coarse pyroclastic rocks in areas underlain by felsic metavolcanics should be explored for base metal deposits. In the Porcupine Camp a Cu-Zn deposit is situated within the calc-alkaline sequence of the Lower Supergroup (Pyke, 1980).

In the Timmins area both nickel-chromium and asbestos deposits are restricted to intrusive equivalents of peridotitic komatiitic rocks (Hutchinson et al. 1971; Pyke, 1980). Komatiitic rocks are exposed in Denton Township and Thorneloe Township. Some of these rocks, particularly those covered by overburden and intersected in diamond drillholes in Thorneloe Township, are a prime target area for exploration for nickel-chromium and asbestos mineralization. Since overburden hinders the effectiveness of some surveys, caution should be exercised when exploration work is planned in this area. Geophysical surveys capable of greater depth penetration would be useful in examing the southernmost metavolcanic units in Denton and Thorneloe Townships which, to the best of the author's knowledge, have not previously been investigated.

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ODM-GSC

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ODM-GSC

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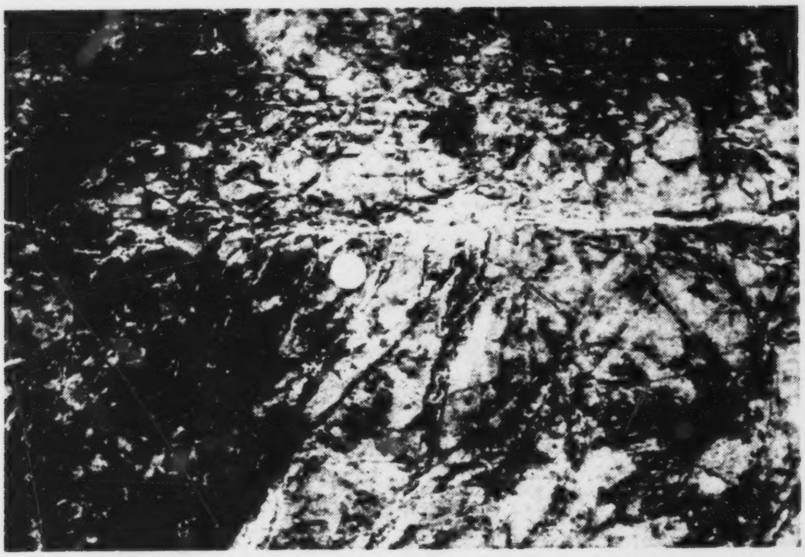

Photo 1: Flow contact with interflow chert between peridotitic komatiitic flows about 200 m north of stripped and trenched zone of Gowest Gold Resources Limited on Mahoney Creek. Top of the lower flow is brecciated while the bottom of the upper flow is chilled and fractured.

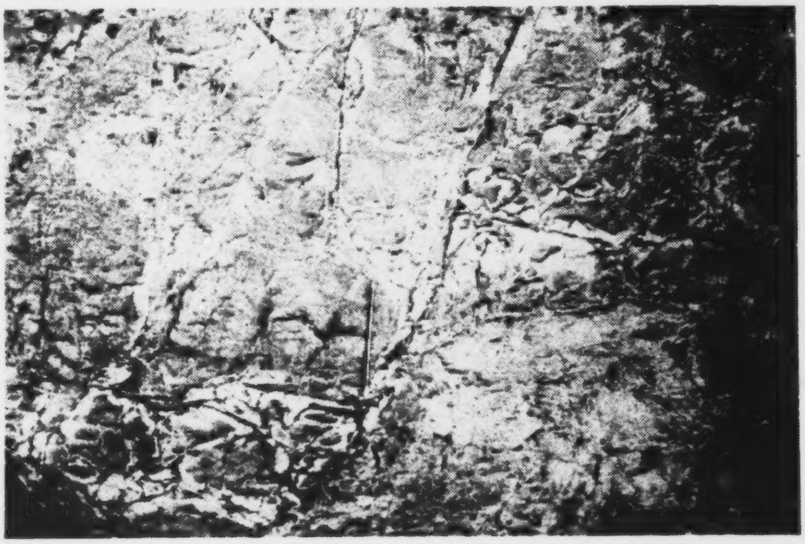

Photo 2: Polysuturing in peridotitic komatiitic flow cut by sall sinistral fault. Outcrop about 10 m north of outcrop of Photo 1.

Photo 3: Stripped and trenched zone on Gowest Gold Resources Limited Property, East side of Mahoney Creek. Denton Township. Light coloured rocks in foreground are pyroxenite komatiite flows intercalated with volcanogenic metasediments of ultramafic detritus.

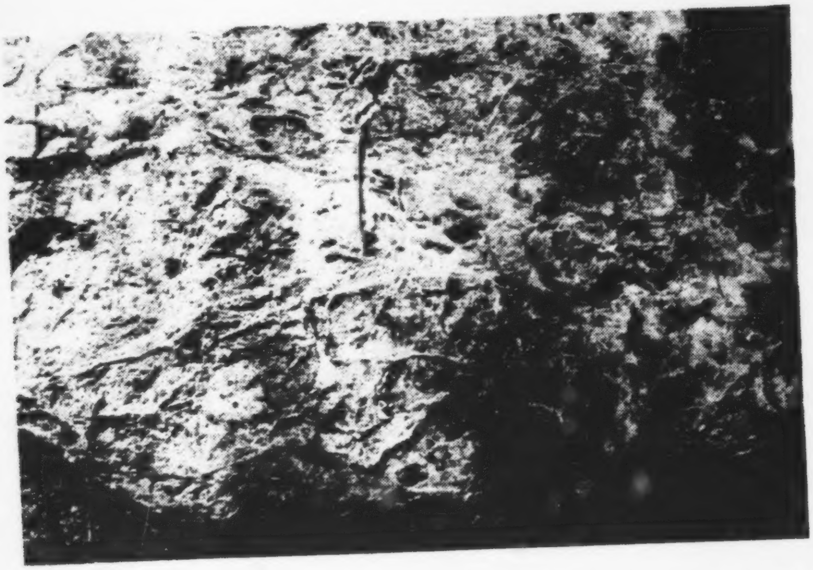

Photo 4: Irregular pyroxene (now altered to tremolite) spinifex in pyroxenitic komatiitic flow located approximately 100 m north of stripped and trenched zone on Gowest Gold Resources Limited Property.

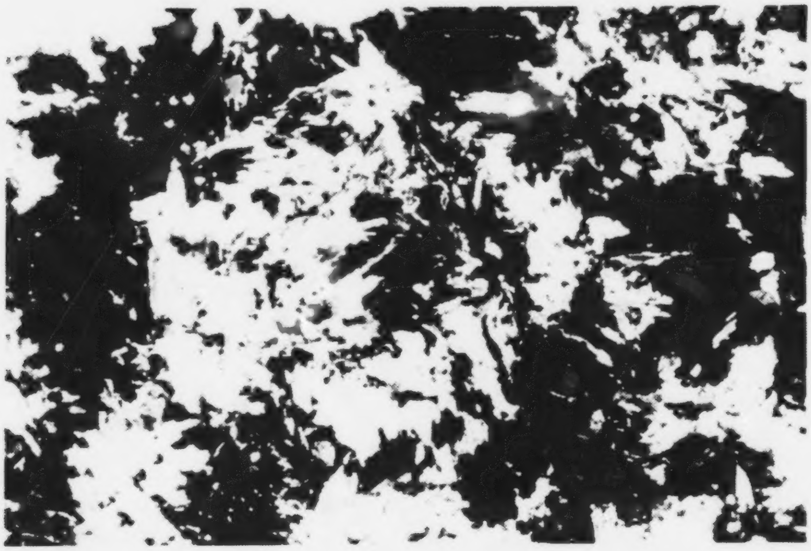

Photo 5: Photomicrograph of pyroxenitic komatiitic flow showing fibrous aggregates of tremolite enclosing dark chlorite aggregates. 40x magnification. Crossed nichols.

Photo 6: Photomicrograph of basaltic komatiite showing plagioclase laths, aggregates of tremolite (light coloured) and chlorite (dark coloured). 40x magnification crossed nichols.

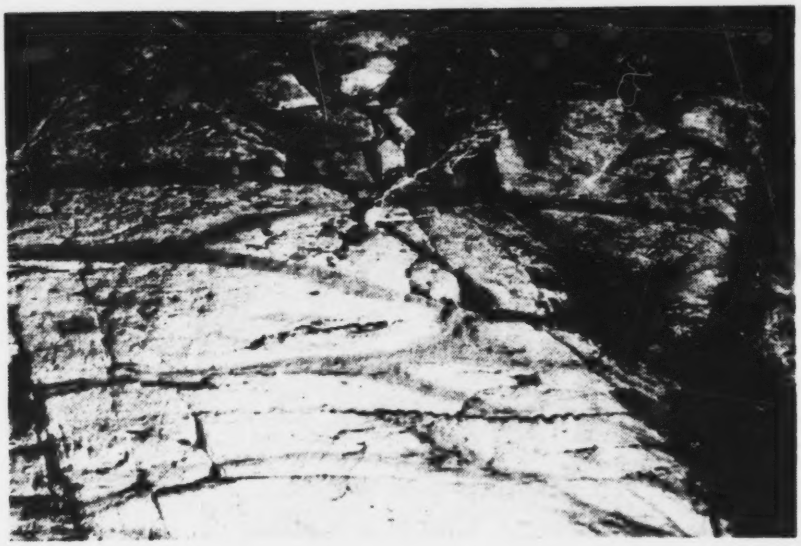

Photo 7: Pillowed andesitic flow on the south shore of small lake in the southwest corner of Keefer Township.

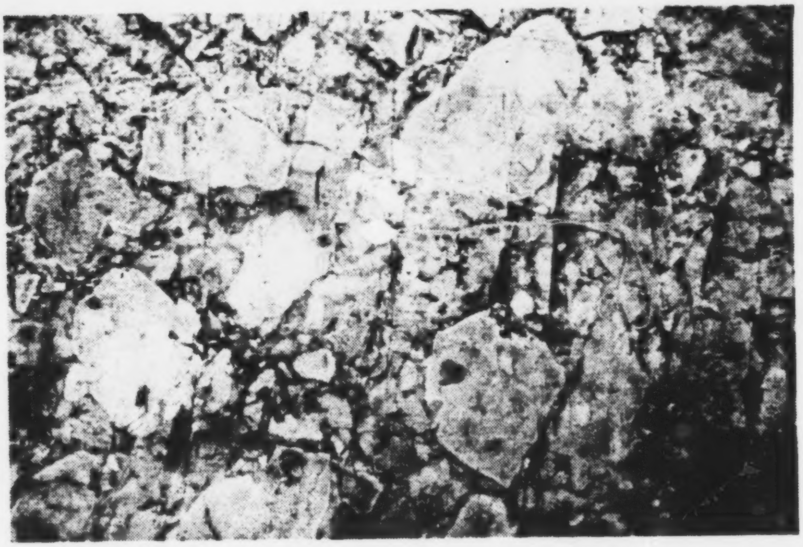

Photo 8: Andesitic pillow breccia southwest of Carlton Lake north of Highway 101.

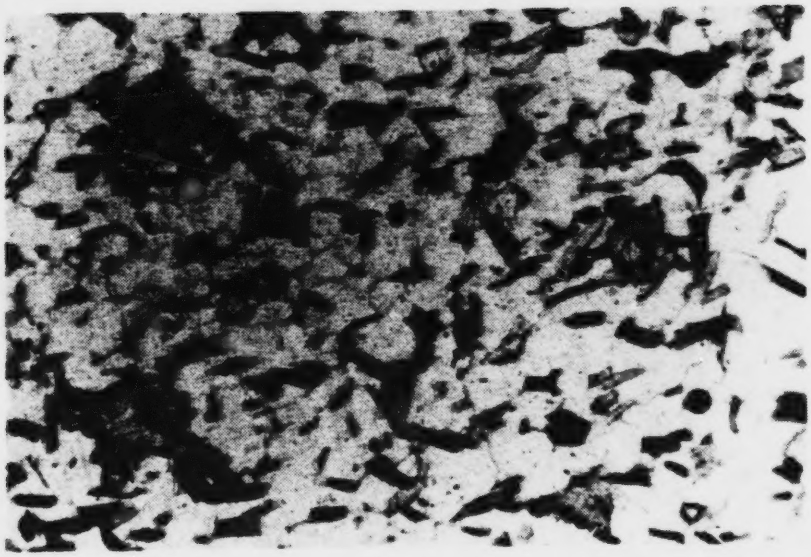

Photo 9: Photomicrograph showing recrystallized tuff containing epidote (high relict) biotite (dark and plagioclase and quartz (light). Plane light 40x magnification.

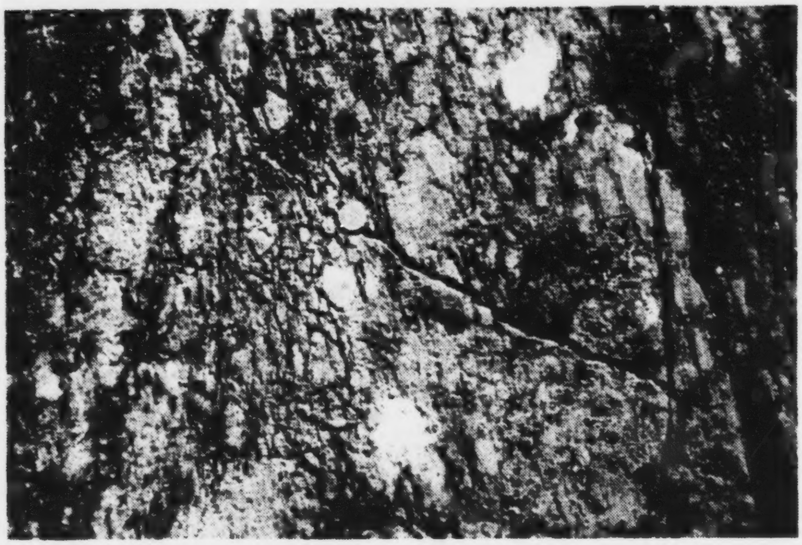

Photo 10: Volcanogenic conglomerate located south of hydroline and approximately 100 m east of gravel road leading to the garbage dump in Denton Township.

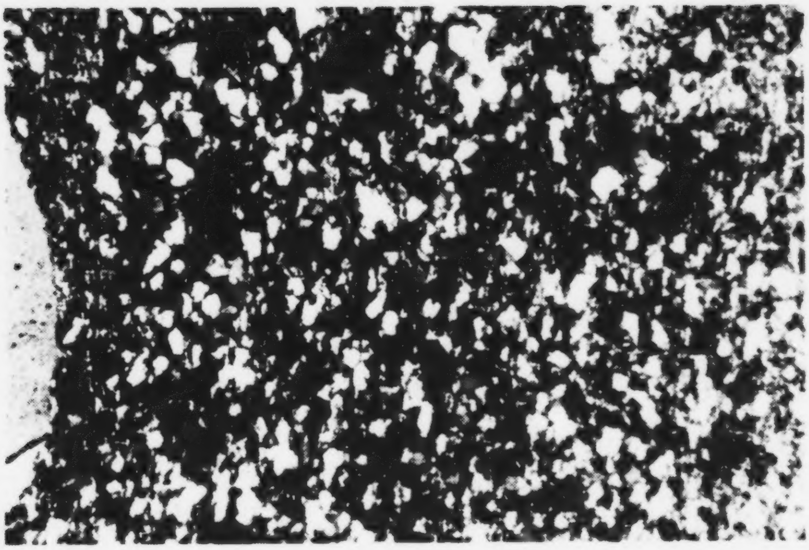

Photo 11: Photomicrograph of very fine-grained arkose showing feldspar and quartz grains set in the matrix of chlorite epidote and magnetite. The rock contains rare up to 3 mm in diameter rounded quartz grains (left edge). Crossed nichols x 40 magnification.

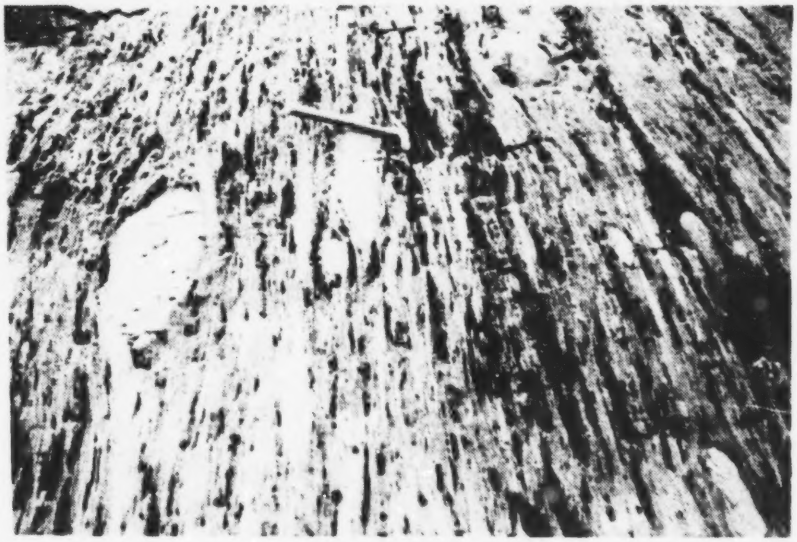

Photo 12: Elongated clasts in conglomerate beds north of Wawaitiw Dam. The clasts are elongated parallel to shearing.

LIST OF PROPERTIES

1	Acme Gas and Oil Company Limited	[1966]	T*
2	Aumo Porcupine Gold Mines Limited		D
3	Bartleman Estate		K
4	Brown McDade Mines Limited		D
5	Canadian Nickel Company Limited	[1979]	D
6	Cominco Limited	[1971]	K
7	Derby G.	[1938]	K
8	Dodds T.	[1938]	K
9	Dominion Gulf Company	[1950]	D
10	Dominion Gulf Company	[1951]	D, T
11	Ellery C.R.		K
12	Falconbridge Nickel Mines Limited	[1972]	D
13	Gagnon Property		D
14	Galata F.	[1959]	K
15	Gambit Consolidated Explorations Limited	[1979]	D
16	Gertie Gold Syndicate	[1948]	T
17	Goldale Mines Limited	[1938]	D
18	Gowest Gold Resources Limited		D
19	Hollinger Consolidated Gold Mines Limited	[1956]	D
20	Hollinger Consolidated Gold Mines Limited	[1959]	T
21	Hollinger Consolidated Gold Mines Limited	[1960]	D
22	Hollinger Consolidated Gold Mines Limited	[1961]	T
23	Hollinger Consolidated Gold Mines Limited	[1962]	T
24	Hollinger Consolidated Gold Mines Limited	[1962]	D
25	Hollinger Consolidated Gold Mines Limited	[1962]	T

26	Hollinger Consolidated Gold Mines Limited	[1965]	K
27	Hollinger Consolidated Gold Mines Limited	[1967]	D
28	Hollinger Mines Limited	[1967]	D, T
29	Hollinger Argus Limited		D
30	Jacomo Mines Limited	[1975]	T
31	Jassie James Mines Limited	[1964]	K
32	Jowsey Denton Gold Mines Limited	[1938]	D
33	Maryland Gold Mines Limited	[1946]	T
34	Maridian Mines and Exploration Company Limited	[1974]	D
35	Macoshen	[1938]	D
36	Mill Hill Mines Limited	[1973]	D, T
37	Moore	[1933]	K
38	O'Neill B.	[1938]	T
39	Paymaster Consolidated Mines Limited	[1962]	T
40	Paymaster Consolidated Mines Limited	[1962]	D
41	Phillip, E.A.	[1947]	D
42	Porcupine Quartet Gold Syndicate	[1938]	D
43	Pyke, D.R.		T
44	Reid, S.	[1938]	D
45	Reid, S.	[1938]	K
46	Scott	[1938]	D
47	Sheehan P.	[1938]	D
48	Simpson-Marcot	[1938]	K
49	Schnubb, E.	[1938]	T
50	Sturgex Mines Limited	[1972]	K
51	Swanson, A.	[1940]	T
52	Texas Gulph Sulpher Company Incorporated	[1971]	K, D

53	Texasgulf Canada Limited		D, T
54	Thibeault, Y. et al.		T
55	Thompson, C.		K
56	Variety Porcupine Gold Mines Limited	[1938]	T
57	Vizina, A.	[1938]	T
58	Wakemac Denton Gold Mines Limited	[1945]	D
59	Whitmarsh, B.	[1977]	K

* T, D and K indicate the properties are in respectively Thorneloe, Denton, and Keefer Townships

METAL AND MINERAL* ABBREVIATIONS

asp	Arsenopyrite
Ag	Silver
Au	Gold
cp	Chalcopyrite
Cr	Chromium
gn	Galena
mag	Magnetite
Ni	Nickel
po	Pyrrhotite
py	Pyrite
qc	Quartz-carbonate vein
qv	Quartz vein
tour	Tourmaline

* This is a composite list for the townships of Keefer, Denton and Thorneloe. Not all metals and minerals occur on each preliminary map sheet.

LEGEND

CENOZOIC

QUATERNARY

PLEISTOCENE AND RECENT

Till; lacustrine deposits; swamp, stream and lake deposits

PRECAMBRIAN

MIDDLE TO LATE PRECAMBRIAN

Diabase Dikes

11 Unsubdivided

11a Porphyritic diabase

11b Quartze diabase

11c Magnetite-rich diabase

INTRUSIVE CONTACT

ARCHEAN

FELSIC TO INTERMEDIATE PLUTONIC ROCKS[a]

10 Unsubdivided

10a Granodiorite

10b Granite

10c Pegmatite and aplite

10d Quartz-feldspar porphyry

INTRUSIVE CONTACT

9 Unsubdivided

9a Porphyritic granodiorite

INTRUSIVE CONTACT

8 Unsubdivided

8a Quartz diorite

8b	Tonalite
8c	Quartz monzodiorite
8d	Pegmatite and aplite

INTRUSIVE CONTACT

METAMORPHOSED MAFIC TO INTERMEDIATE INTRUSIVE ROCKS

7	Unsubdivided
7a	Diorite
7b	Quartz diorite

INTRUSIVE CONTACT?

6	Unsubdivided
6a	Gabbro
6b	Diorite

INTRUSIVE CONTACT

METAVOLCANICS AND METASEDIMENTS

CLASTIC METASEDIMENTS

5	Unsubdivided
5a	Mudstone, phyllite, quartz-sericite schist
5b	Wacke, lithwacke
5c	Subarkosic wacke
5d	Polymictic pebble and cobble conglomerate
5e	Pebbly sandstone
5f	Carbonate fuchsite schist
5g	Quartzite

CHEMICAL METASEDIMENTS

4	Unsubdivided
4a	Banded magnetite-quartz iron formation
4b	Magnetite-epidote iron formation

4c	Sulphide iron formation

FELSIC TO INTERMEDIATE METAVOLCANICS

3	Unsubdivided
3a	Massive flow and autoclastic breccia
3b	Pillowed flows
3c	Pillow breccia
3d	Porphyritic flows
3e	Tuff, crystal tuff, laminated tuff
3f	Lapilli tuff, lapillistone
3h	Tuff breccia, pyroclastic breccia
3j	Volcaniclastic metasediments[b]

MAFIC TO INTERMEDIATE METAVOLCANICS

2	Unsubdivided
2a	Massive flows and autoclastic (flow) breccia
2b	Pillowed flows, pillow breccia
2c	Tuff and other pyroclastic rocks
2d	Amygdaloidal flows
2e	Amphibolite
2f	Coarse-grained flows
2g	Metasediments composed of volcanic detritus

ULTRAMAFIC TO MAFIC METAVOLCANICS

1	Unsubdivided
1a	Massive flows and flow breccia
1b	Pillowed flows and pillow breccia
1c	Polysutured flows
1d	Serpentinized peridotite[c]
1e	Talc-carbonate schist

1f Metasediments composed of volcanic detritus[d]

1g Spinifex flows

Notes:

a) Plutonic rocks are classified following IUGS classifications.

b) Constitutes material derived almost exclusively from units 3e and 3f.

c) May be in part intrusive.

d) Constitutes turbidite sequence derived almost exclusively from ultramafic volcanics.

KEEFER, DENTON AND THORNELOE AREA

NTS Reference 42 A/5 and 42 A/6

ODM-GSC Aeromagnetic Maps 293G and 2299G

ODM Compilation Map 2205 and 2046

SOURCE OF INFORMATION

Geology by A.G. Choudhry and assistants, 1981.

Map 47d Ontario Department of Mines, 1938.

Maps P.27, P.28 and P.29 Ontario Department of Mines, 1957.

Geological maps and reports of mining companies and other government agencies.

Base map derived from Ontario Department of Lands and Forest, Forest Resources Inventory.

Magnetic declineation in the centre of area in December 1981 9°37.9' with an annual positive change of 4.8 minutes.

Geology is not tied to survey lines.

Table 1: Table of Lithologic units for Keefer, Denton and Thorneloe Townships

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CENOZOIC
  QUATERNARY
    RECENT
      Stream, swamp and lake deposits
    PLEISTOCENE
      Till, lacustrine and glaciofluvial gravel, sand and clay

Unconformity

PRECAMBRIAN
  MIDDLE PRECAMBRIAN (PROTEROZOIC)
    DIABASE DIKES
      Porphyritic quartz diabase, quartz diabase, magnetite-rich quartz diabase

Intrusive Contact

  EARLY PRECAMBRIAN (Archean)
    INTERMEDIATE TO FELSIC INTRUSIVE ROCKS
      Leucocratic granodiorite; porphyritic granodiorite; quartz diorite, tonalite and quartz monzodiorite; quartz feldspar porphyry

Intrusive Contact

    METAMORPHOSED MAFIC TO INTERMEDIATE INTRUSIVE ROCKS
      Gabbro, diorite, quartz diorite

Table 1. Continued.

Intrusive Contact

METAVOLCANICS AND METASEDIMENTS*

METASEDIMENTS

Mudstone, siltstone and phyllite; wacke, arkosic lithwacke, carbonate-fuchsite schist; pebbly sandstone, granite polymictic pebble to cobble conglomerate; quartzite; ironstone (siliceous sulphide and oxide-bearing phases)

METAVOLCANICS

Felsic to Intermediate Metavolcanics

Massive, pillowed and porphyritic flows and related breccia; tuff, crystal tuff, lapilli tuff, tuff breccia and pyroclastic breccia, schistose sericitic rocks, volcanogenic metasediments

Mafic to Intermediate Metavolcanics

Massive, pillowed, amygdaloidal flows and related breccia and hyaloclastite; coarse-grained flows; tuff and other pyroclastic rocks; amphibolite; volcanogenic metasediments

Ultramafic to Mafic Metavolcanics

Massive, pillowed, polysutured and spinifex flows and relaed breccia; serpentinized peridotite and talc-carbonate schist; volcanogenic metasediments

* These rocks are divided lithologically and their position in the table does not imply relative age.

Table 2. Chemical analyses of samples collected from the map area.

	1	2	3	4	5	6	7	8	9	10	11	12
Analysis No.	81AGC	81AGC	81AGC	81AGC	81AGC	81AGC	81AGC	81AGC	81AGC	81AGC	81AGC	81AGC
Samie No.	0009	0069	0121	0122	0218	0219	0400	0407	0125	0382	0378	0091
MAJOR ELEMENT OXIDES (Weight percent)												
SiO_2	36.80	44.4	42.20	45.90	43.00	41.10	40.30	41.50	48.80	45.00	45.50	45.00
Al_2O_3	0.88	6.68	7.08	5.87	7.30	5.48	6.42	5.21	12.70	15.30	16.40	16.50
Fe_2O_3	1.90	2.05	2.14	1.99	2.05	2.02	2.21	2.04	2.17	2.20	2.36	2.42
FeO	5.70	9.46	9.51	8.92	10.41	9.70	9.32	9.2	8.71	7.84	8.60	8.69
MgO	40.00	21.80	24.10	22.00	19.30	28.10	21.00	28.6	10.30	11.10	9.42	8.96
CaO	0.02	8.19	6.54	8.71	10.20	5.13	5.89	4.47	11.10	10.50	11.00	11.00
Na_2O	0.00	0.00	0.03	0.00	1.10	0.30	1.13	0.14	1.81	1.30	1.90	2.09
K_2O	0.00	0.00	0.00	0.00	0.02	0.00	0.00	0.00	0.24	0.00	0.00	0.02
TiO_2	0.10	0.39	0.45	0.36	0.41	0.35	0.38	0.36	0.59	0.56	0.76	0.80
P_2O_5	0.01	0.03	0.04	0.03	0.03	0.03	0.03	0.03	0.01	0.04	0.05	0.07
MnO	0.06	0.19	0.16	0.19	0.22	0.17	0.15	0.19	0.19	0.15	0.16	0.16
CO_2	6.30	0.30	0.61	0.26	1.73	0.31	9.01	0.27	0.48	0.91	0.16	0.21
S		0.01	0.08	0.01	0.09	0.01	0.01	0.02	0.01	0.09	0.01	0.03
L.O.I. (LOI-CO_2)	15.4	5.60	6.70	5.30	5.10	7.00	13.00	8.10	1.50	4.50	3.50	3.20
Total	107.17	99.10	99.64	99.54	100.96	99.70	108.85	100.13	98.61	99.49	99.82	99.15
TRACE ELEMENTS (in parts per million)												
Pd	<1	4	6	2	6	5	3	5	19	<1	<1	<1
Pt	<1	4	6	3	6	4	5	5	26	<1	<1	<1
Ba	20	30	130	120	140	120	20	20	60	20	80	140
Co	74	84	71	78	85	83	99	94	43	58	44	46
Cr	805	2040	1980	2010	2760	2020	2090	2050	480	314	203	191
Cu	<5	<5	68	<5	99	25	65	39	72	76	23	72
Li	<3	4	9	3	6	<3	9	<3	6	9	14	11
Ni	2460	1410	1010	1350	1150	1390	1100	1600	130	260	187	191
Pb	<10	22	26	<10	<10	<10	<10	<10	<10	<10	<10	<10
U	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
Zn	23	118	62	110	82	56	65	82	68	72	81	72
Nb	5	10	11	9	9	9	11	15	14	13	16	12
Rb	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10
Sr	9	9	10	9	45	14	40	10	65	95	120	120
V	19	145	130	115	145	125	125	105	225	145	210	220
Y	<2	4	3	2	4	4	3	5	10	8	11	10
Zr	10	15	14	13	18	25	25	19	13	21	25	17
Au	0.003	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002

Table 2. Continued.

	13	14	15	16	17	18	19	20	21	22	23	24
	81AGC 0119	81AGC 0142	81AGC 0343	81AGC 0143	81AGC 0341	81AGC 0406	81AGC 0123	81AGC 0223	81AGC 0346	81AGC 0077	81AGC 0162	81AGC 0421
MAJOR ELEMENT OXIDES (Weight percent)												
SiO_2	49.40	48.30	47.90	50.60	46.90	49.40	45.80	50.60	47.40	49.30	49.10	43.00
Al_2O_3	13.00	13.80	15.00	14.10	12.20	14.00	14.10	14.20	14.20	12.40	12.40	13.40
Fe_2O_3	2.02	2.34	2.45	2.34	2.45	2.13	3.61	2.39	3.16	3.08	3.77	2.71
FeO	8.26	9.14	9.78	9.75	9.78	9.82	12.47	9.54	11.24	13.01	13.16	19.73
MgO	9.07	7.62	6.92	7.34	9.07	6.69	7.80	6.14	5.92	5.70	4.85	3.96
CaO	0.70	9.81	10.80	11.10	12.30	13.30	5.94	11.60	9.55	9.32	9.51	9.13
Na_2O	2.97	2.37	2.42	1.80	0.79	0.67	3.79	1.49	1.80	1.83	1.04	0.96
K_2O	0.32	0.65	0.14	0.11	0.06	0.14	0.00	0.19	0.13	0.33	0.04	0.36
TiO_2	0.95	0.71	0.85	0.79	0.71	0.56	1.93	0.82	1.49	1.47	2.11	1.03
P_2O_5	0.38	0.06	0.07	0.06	0.06	0.05	0.16	0.07	0.14	0.12	0.18	-0.14
MnO	0.18	0.22	0.18	0.20	0.18	0.21	0.21	0.23	0.20	0.25	0.25	0.43
CO_2	0.30	1.67	0.12	0.10	0.87	0.39	0.21	0.37	0.39	0.17	0.20	0.20
S	0.01	0.08	0.07	0.01	0.01	0.03	0.01	0.05	0.11	0.15	0.02	0.02
L.O.I. (LOI-CO_2)	1.70	3.70	2.20	0.70	3.00	1.70	3.00	1.10	2.70	1.00	2.80	2.80
Total	89.26	100.47	98.90	99.00	98.38	99.09	99.03	98.79	98.43	98.13	99.43	97.87
TRACE ELEMENTS (in parts per million)												
Pd	<1	13	<1	13	<1	11	<1	<1	<1	<1	<1	<1
Pt	3	11	<1	13	2	11	<1	<1	<1	<1	<1	<1
Ba	100	250	40	60	40	60	40	80	40	110	50	140
Co	35	40	46	39	46	40	48	41	47	46	43	31
Cr	365	289	295	149	295	294	100	100	70	45	19	13
Cu	14	112	72	82	72	40	60	142	53	48	86	6
Li	9	26	8	4	8	6	12	8	13	5	13	10
Ni	160	84	141	50	141	133	90	67	83	41	20	15
Pb	59	20	<10	<10	<10	<10	38	31	<10	16	<10	<10
U	<1	<1	<1	<1	<1	<1	<1	<1	<1	>1	>1	>1
Zn	76	90	90	86	90	81	134	100	143	130	152	12
Nb	15	14	16	16	12	17	25	16	21	25	25	16
Rb	<10	20	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10
Sr	510	170	110	65	85	85	75	145	185	125	445	200
V	195	255	250	255	180	235	285	295	315	435	345	95
Y	14	11	16	13	12	17	23	16	30	30	30	30
Zr	60	21	35		30	23	50	35	35	55	65	65
Au	<0.002	<0.002	<0.002	0.009	<0.002	<0.002	0.003	0.003	<0.002	<0.002	<0.002	<0.002

Table 2. Continued.

	25	26	27	28	29	30	31	32	33	34	35	36
	81AGC 0005	81AGC 0315	81AGC 0056	81AGC 0099	81AGC 0010	81AGC 0144	81AGC 0145	81AGC 0310	81AGC 0427	81AGC 0163	81AGC 0184	81AGC 0214
MAJOR ELEMENT OXIDES (Weight percent)												
SiO_2	49.20	52.60	60.70	58.80	46.70	44.80	48.20	46.00	46.40	47.50	62.20	60.10
Al_2O_3	14.90	16.00	16.40	14.60	13.10	14.30	12.60	16.10	16.60	19.30	15.70	17.10
Fe_2O_3	2.78	3.36	2.33	2.50	3.00	2.88	3.19	2.69	3.01	2.36	2.12	2.36
FeO	8.23	8.60	4.64	8.49	12.29	10.51	12.15	9.55	10.93	5.38	4.52	4.93
MgO	3.93	3.33	2.08	0.88	5.47	5.12	5.20	6.91	3.88	3.59	3.27	2.75
CaO	10.90	5.96	3.57	6.69	10.80	14.80	10.20	10.30	11.80	7.05	2.54	2.12
Na_2O	2.04	3.95	5.78	2.89	3.08	1.68	3.46	2.99	2.91	4.92	5.61	3.97
K_2O	0.58	0.03	0.36	0.41	0.38	0.34	0.40	0.21	0.26	1.58	0.81	2.29
TiO_2	1.07	1.70	0.75	0.91	1.38	1.25	1.60	1.06	1.28	0.67	0.56	0.78
P_2O_5	0.11	0.16	0.11	0.32	0.12	0.11	0.13	0.08	0.11	0.04	0.08	0.13
MnO	0.23	0.13	0.10	0.20	0.35	0.28	0.31	0.15	0.21	0.14	0.14	0.09
CO_2	3.19	1.08	1.00	0.21	0.36	1.13	0.42	0.30	0.21	4.67	0.30	0.09
S	0.04	0.01	0.02	0.01	0.03	0.02	0.06	0.08	0.01	0.01	0.01	0.39
L.O.I. (LOI-CO_2)	5.30	3.60	2.50	1.70	1.30	1.95	0.52	2.22	1.18	2.42	1.09	2.12
Total	102.50	100.51	100.34	98.61	98.36	99.17	98.44	98.64	98.79	99.63	98.95	99.22
TRACE ELEMENTS (In parts per million)												
Pd	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
Pt	<1	<1	<1	<1	<1	2	<1	<1	<1	3	<1	<1
Ba	210	170	70	140	230	170	220	60	70	310	160	520
Co	47	31	18	12	40	42	43	45	48	39	15	27
Cr	113	10	29	8	170	222	333	249	309	262	18	136
Cu	88	12	18	12	58	29	30	82	7	30	6	74
Li	10	12	14	9	6	<3	4	12	6	28	24	20
Ni	78	29	24	5	40	80	20	86	139	225	18	87
Pb	<10	<10	21	<10	16	<10	<10	<10	<10	<10	<10	<10
U	>1	<1	>1	>1	<1	<1	<1	<1	<1	<1	<1	<1
Zn	105	119	82	140	118	100	125	76	108	59	51	100
Nb	18	18	10	12	21	16	24	16	22	13	10	12
Rb	10	<10	<10	20	<10	<10	<10	<10	<10	50	30	80
Sr	120	195	270	170	310	65	150	220	185	140	185	520
V	285	210	125	13	335	275	360	265	245	210	95	130
Y	21	30	13	55	25	19	30	14	22	8	7	12
Zr	25	90	80	140	55	50	60	35	35	18	65	110
Au	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	0.007	<0.002	<0.002	<0.002	0.007

Table 2. Continued.

	37	38	39	40	41	42	43	44
	81AGC 304	81AGC 314	81AGC 0166	81AGC 0213	81AGC 008	81AGC 0055	81AGC 0215	81AGC 0098
MAJOR ELEMENT OXIDES (Weight percent)								
SiO_2	60.70	58.50	64.10	66.40	78.00	48.40	47.40	47.80
Al_2O_3	16.00	17.40	14.80	16.20	13.40	13.70	15.20	15.60
Fe_2O_3	2.21	2.50	2.09	1.97	1.69	3.60	2.73	2.50
FeO	4.47	5.29	1.38	1.50	0.34	13.97	10.28	9.62
MgO	3.5	3.76	1.63	2.11	0.20	3.95	7.08	7.14
CaO	3.96	1.92	3.83	2.26	1.89	6.95	10.10	8.87
Na_2O	5.61	6.06	2.89	3.76	0.76	4.09	2.07	2.45
K_2O	0.56	0.28	2.90	2.08	0.75	0.12	0.26	0.00
TiO_2	0.66	0.92	0.47	0.41	0.41	1.98	1.12	0.87
P_2O_5	0.10	0.20	0.11	0.09	0.03	0.13	0.08	0.06
MnO	0.09	0.11	0.03	0.06	0.04	0.22	0.19	0.15
CO_2	0.27	0.16	3.11	0.12	0.37	0.19	0.26	0.65
S	0.01	0.01	0.14	0.06	0.05	0.22	0.10	0.28
L.O.I. (LOI-CO_2)	1.42	2.13	1.55	1.72	1.48	1.39	2.34	2.57
Total	99.56	99.24	99.03	98.74	99.41	98.91	99.21	98.56
TRACE ELEMENTS (in parts per million)								
Pd	<1	<1	<1	<1	<1	<1	<1	<1
Pt	<1	<1	<1	<1	<1	<1	<1	<1
Ba	200	130	430	450	900	80	120	130
Co	22	16	<5	13	<5	28	49	42
Cr	71	<5	13	77	<5	<5	87	308
Cu	38	7	9	15	6	32	90	102
Li	12	14	12	18	333	4	10	7
Ni	43	<5	8	40	<5	12	99	150
Pb	<10	<10	<10	10	13	<10	<10	<10
U	<1	<1	<1	<1	<1	<1	<1	<1
Zn	80	124	20	64	52	130	96	68
Nb	9	10	5	8	6	30	16	16
Rb	20	<10	90	70	20	<10	<10	<10
Sr	230	185	80	520	225	110	205	120
V	120	50	50	65	2	445	270	245
Y	9	22	6	8	65	23	12	11
Zr	75	90	115	75	130	35	35	22
Au	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002

Table 2. Continued.

Analysis No.	Sample No.	Latitute	Longitude	Sample description
1	81AGC0009	48.37722°	81.58614°	Medium grained, dark green, massive, peridotitic komatiite
2	81AGC0069	48.32431°	81.69861°	Fine-grained, light-grey, peridotitic komatiite flow
3	81AGC0121	48.34055°	81.62416°	Fine-grained, light grey to dark grey peridotitic komatiite flow
4	81AGC0122	48.34000°	81.62360°	Fine-grained, light grey, polysutured deformed peridotitic komatiite pillow flow
5	81AGC0218	48.31638°	81.63860°	Fine-grained, light grey to dark grey, deformed pyroxenitic komatiite flow
6	81AGC0219	48.31682°	81.64027°	Fine-grained, light grey to dark grey, peridotitic komatiite flow
7	81AGC0400	48.33472°	81.61166°	Fine-grained, light grey, strongly deformed peridotitic komatiite flow
8	81AGC0407	48.31458°	81.63591°	Fine-grained, light-grey to dark-grey, deformed peridotitic komatiite flow
9	81AGC0125	48.32443°	81.60500°	Medium grained, recrystallized, green-grey komatiitic basalt
10	81AGC0382	48.29402°	81.72350°	Fine to medium grained, light to medium grey, massive to foliated Mg-tholeiitic flow
11	81AGC0378	48.29860°	81.79694°	Fine grained, green-grey, massive to foliated tholeiitic Mg basalt flow
12	81AGC0091	48.30556°	81.70555°	Fine-grained to medium grained, green grey, massive, thick Mg tholeiitic basalt flow
13	81AGC0119	48.28763°	81.82361°	Fine-to medium grained green-grey, recrystallized Mg tholeiitic basalt
14	81AGC0142	48.32916°	81.57201°	Fine-grained dark grey, massive tholeiitic Mg basalt flow
15	81AGC0343	48.34444°	81.68471°	Fine-grained, medium to dark grey, pillowed Mg tholeiitic basalt flow
16	81AGC0143	48.32819°	81.56325°	Very fine grained, dark grey, massive Mg tholeiitic basaltic flow
17	81AGC0341	48.33861°	81.69333°	Fine grained, medium to dark green grey, Mg tholeiitic basalt
18	81AGC0406	48.31917°	81.62999°	Fine grained, medium dark-grey, Fe-tholeiitic basalt
19	81AGC0123	48.33861°	81.62416°	Fine grained, dark grey to black, pillowed Fe tholeiite flow
20	81AGC0223	48.32082°	81.63582°	Fine to medium grained, dark grey, deformed Fe tholeiite basalt
21	81AGC0346	48.29860°	81.79694°	Fine to medium grained, dark grey to black, deformed Fe tholeiite
22	81AGC0077	48.32808°	81.69167°	Fine-grained, dark grey to black, foliated Fe tholeiite
23	81AGC0162	48.33749°	81.62555°	Fine-grained, dark grey to black, massive Fe tholeiite flow
24	81AGC0421	48.34610°	81.68013°	Porphyritic amphinitic, black to dark grey, pyroxene phenocryst, Fe tholeiite
25	81AGC0005	48.28999°	81.80721°	Very fine grained, medium to dark grey,, massive tholeiitic andesite flow
26	81AGC0315	48.29832°	81.74318°	Fine-grained, dark green, sheared tholeiitic andesite
27	81AGC0056	48.29610°	81.77249°	Fine grained, medium dark-grey to green grey, massive tholeiitic dacite
28	81AGC0099	48.32249°	81.71111°	Fine grained, medium dark green grey, sheared, tholeiitic dacite
29	81AGC0010	48.36388°	81.55916°	Fine-grained, dark-grey to black, massive calcalkaline basalt
30	81AGC0144	48.36388°	81.57884°	Very fine grained, green-grey to dark grey calc alkaline basalt pillow flow
31	81AGC0145	48.36208°	81.58076°	Very fine grained, dark grey calcalkaline basalt pillow flow
32	81AGC0310	48.29361°	81.77222°	Medium grained, light grey, thick calcalkaline basalt flow
33	81AGC0427	48.34457°	81.57776°	Fine to medium grained, dark grey, massive calcalkaline basalt flow
34	81AGC0163	48.33556°	81.62694°	Fine grained, light grey, massive calcalkaline andesite
35	81AGC0184	48.31012°	81.78032°	Fine grained, light grey, sheared calcalkaline andesite
36	81AGC0214	48.36388°	81.54332°	Very fine grained, dark grey, massive calcalkaline andesite tuff
37	81AGC0304	48.29832°	81.78818°	Porphyritic (Plag) aphinitic, medium grey, massive calcalkaline andesite flow
38	81AGC0314	48.30707°	81.75233°	Fine grained, green grey calcalkaline andesitic crystal tuff
39	81AGC0166	48.36082°	81.64499°	Fine grained, light grey, sheared calcalkaline dacite tuff
40	81AGC0213	48.36360°	81.54485°	Very fine grained, light grey, calc-alkaline dacite trap
41	81AGC0008	48.33611°	81.69028°	Very fine grained, thinnly bedded arkose
42	81AGC0055	48.29860°	81.78416°	Medium grained, massive to foliated, mafic intrusive rock
43	81AGC0215	48.36166°	81.59991°	Medium grained dark green massive, mafic intrusive rock
44	81AGC0098	48.30443°	81.71721°	Very fine grained, medium dark green diabase dike

Table 3: Modal Analyses in Volume Percent of Intermediate to Felsic Intrusive of Keefer, Denton, and Thornloe Townships.

LITHOLOGY	Quartz Diorite Stock		Quartz Diorite, Tonalite and Quartz Monzodiorite					Porphyritic Granodiorite		Leucocratic Granodiorite	
Sample Number	81A 0017	81A 0181	81A 0170	81A 0102	81A 0175	81A 0011	81A 0078	81A 0195	81A 0198	81A 0207	81A 0200
Plagioclase	65.2	58.1	63.3	67.4	55.4	57.2	42.2	59.0	63.8	57.6	53.4
Potassium Feldspar			4.1	4.9	5.5	3.0	10.1	15.2	9.6	15.7	18.1
Quartz	5.3	5.4	4.8	13.5	35.4	12.7	12.4	19.2	17.0	25.5	27.5
Hornblende	18.6	27.3				23.6	27.3	5.2	3.7		
Biotite		5.2		5.3				0.2	2.3	0.6	0.5
Mgnetite	3.4	0.8		x		0.5				x	x
Sphene	1.8	x		0.5	x	0.2	0.3	1.1	0.6	0.1	x
Apatite	0.2	x			x	0.1	x	x	x		
Epidote	3.4	3.2	1.2	4.0	1.1	1.7	5.7	0.2	1.2	0.4	0.1
Chlorite	2.1		20.6	4.3	2.4		2.9	x	1.4	0.1	0.2
Leucoxene			x								
Muscovite					0.2					x	0.2
Myrmekite								0.4	0.4	x	x

x Present in trace amounts

Table 4: Summary of Exploration Work in Keefer, Denton and Thorneloe Townships

Property Number on the Map	Property Name	Number of Claims	Geophysics		Geo-chemical	Geo-logical	Diamond Drilling		Trenching and Stripping	Assessment File Number		Township/s	Year Work Performed
			Mg	Em			Number of Holes	Total (Meters)		Timmins	Toronto		
1	Acme Gas and Oil Company Limited	32	•	•						T.1291	63.1893	T	1966
2	Aumo Porcupine Gold Mines Limited	6				•	Extensive	Extensive	•	T.10		D	1910-1981
3	Bartleman Estate	4					13	1733	•	T.678		K	1962
4	Brown McDade Mines Limited	11	•			•	8	129	•	T.1991	2.3842	D	1981
5	Canadian Nickel Company Limited	22	•	•		•	5	462	•	T.1834	2.3839 2.3096	D	1978, 1980
6	Cominco Limited	70	•							T.25	2.618	K	1971
7	Dorby G.	21							•	T.82		T	1938
8	Dodds T.	8							•			K	1938
9	Dominion Gulf Company	35	•			•				T.397	63.218	D	1950
10	Dominion Gulf Company	57	•				4	570		T.464	63.246	D,T	1950, 1951
11	Ellery C.R.	5										K	
12	Falconbridge Nickel Mines Limited	12	•							T.1520	2.1020	D	1972
13	Gagnon Property	14	•	•						T.1981	2.3231	D	1979
14	Galata F.	27				•				T.670 T.1556		K	1959-1978
15	Gambit Consolidated Explorations Limited	9	•	•			3	275	•	T.1865	2.2611	D	1977
16	Gertie Gold Syndicate	8	•				5	1045		T.195		T	1946 & 1947
17	Goldale Mines Limited	22					7	46 m	•			K	1933
18	Gowest Gold Resources Limited	11				•			•		63.3840	D	1981
19	Hollinger Consolidated Gold Mines Limited	10	•			•	16	1527		T.584		D	1956
20	Hollinger Consolidated Gold Mines Limited	48	•	•			13	1963		T.556	63.1000	D, T	1959
21	Hollinger Consolidated Gold Mines Limited	18					1	422		T.556		D, T	1960
22	Hollinger Consolidated Gold Mines Limited	42					4	476		T.675		T	1961
23	Hollinger Consolidated Gold Mines Limited	28	•	•		•	3	700		T.538	63.1174	T	1962
24	Hollinger Consolidated Gold Mines Limited	31	•	•		•	5	1203		T.335	63.1092	D	1960-1962
25	Hollinger Consolidated Gold Mines Limited	17					4	1060		T.556		T	1962
26	Hollinger Consolidated Gold Mines Limited	15	•	•		•				T.1148	63.1597	K	1965
27	Hollinger Consolidated Gold Mines Limited	65	•	•		•	3	708		T.698	63.1165	D	1961-1967
28	Hollinger Mines Limited	14	•	•			15	1550		T.556	63.1000	D, T	1965-1967
29	Hollinger Mines Limited	20		•		•					2.3975	D	1981
30	Jacomo Mines Limited	8	•	•			1	195		T.1631	63.3317, 2.1706 & 2.1497	T	1974

Table 4. Continued.

Property Number on the Map	Property Name	Number of Claims	Geophysics		Geo-chemical	Geo-logical	Diamond Drilling		Trenching and Stripping	Assessment File Number		Township/s*	Year Work Performed
			Mg	Em			Number of Holes	Total (Meters)		Timmins	Toronto		
31	Jassie James Mines Limited	34								T.521		K	1964
32	Jowsey Denton Gold Mines Limited	14					•	•		T.71		D	1938
33	Meridian Mining and Exploration Company Limited	56	•	•			4	126-5		T.1569	2.1257	D	1974
34	Maryland Gold Mines Limited	10					2	527	•	T.82		T	1946
35	Macoshen	7							•			D	1930
36	Hill Hill Mines Limited	21	•	•						T.1532	63.3006	D, T	1973
37	Moore	22					•		•			K	1933
38	O'Neill B.	60							•			T	1937
39	Paymaster Consolidated Mines Limited	9		•			2	100		T.602	63.1105	T	1962
40	Paymaster Consolidated Mines Limited	14		•		•				T.104	63.1105	D	1962
41	Phillip, E.A.	23					2	257	•	T.104		T, D	1938, 1947
42	Porcupine Quartet Gold Syndicate	13							•				1936
43	Pyke, D.R.	9			•		16	41.1	•		2.4237	T	1980
44	Reid, S.	19					7	915	•			D	1936
45	Reid, S.	10							•			K	1938
46	Scott	5							•			D	1938
47	Sheehan, P.	9							•			D	1938
48	Simpson-Marcot	13							•			K	1936
49	Schnubb, E.	3							•			T	1937
50	Sturgex Mines Limited	21								T.229		K	1972
51	Swanson, A.	4							•	T.82		T	1938
52	Texas Gulp	41	•	•			3			T.414	2.671	K	1971
53	Texasgulf Canada Limited	57	•	•						T.1941	2.3889	D, T	1981
54	Thibeault, Y.	22					14	1015	•	T.82		T	1933-1937
55	Thompson, C.	6										K	
56	Variety Porcupine Gold Mines Limited	6							•	T.82		T	1938
57	Vizina, A.	9							•				1938
58	Vakmac Denton Gold Mines Limited	25					12	1296	•	T.458		D	1945
59	Whitmargh, B.	4							•	T.1738		K	1977

* T, D and K indicate the properties are in respectively Thorneloe, Denton, and Keefer Township.

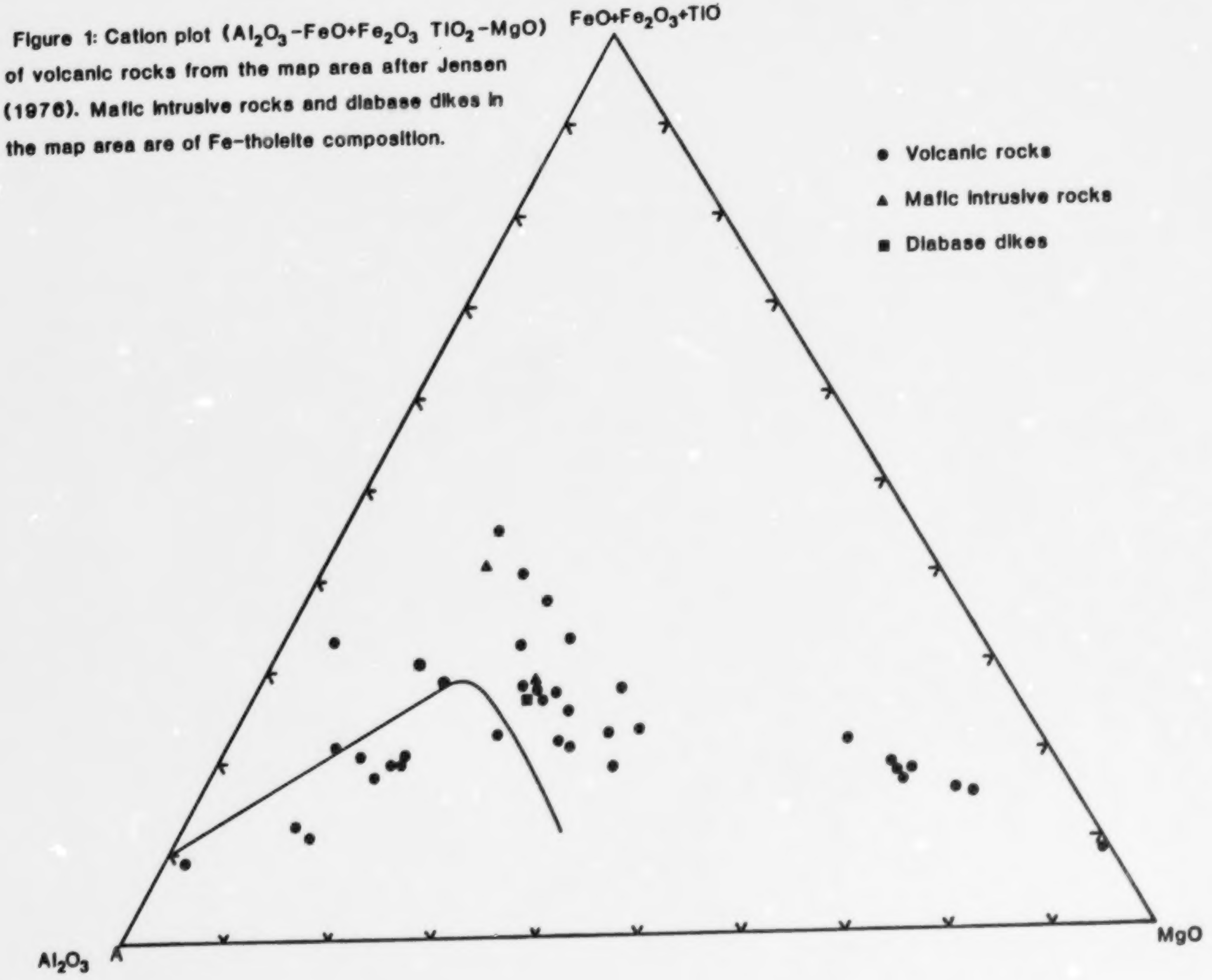

Figure 1: Cation plot (Al_2O_3–FeO+Fe_2O_3 TiO_2–MgO) of volcanic rocks from the map area after Jensen (1976). Mafic intrusive rocks and diabase dikes in the map area are of Fe–tholeite composition.

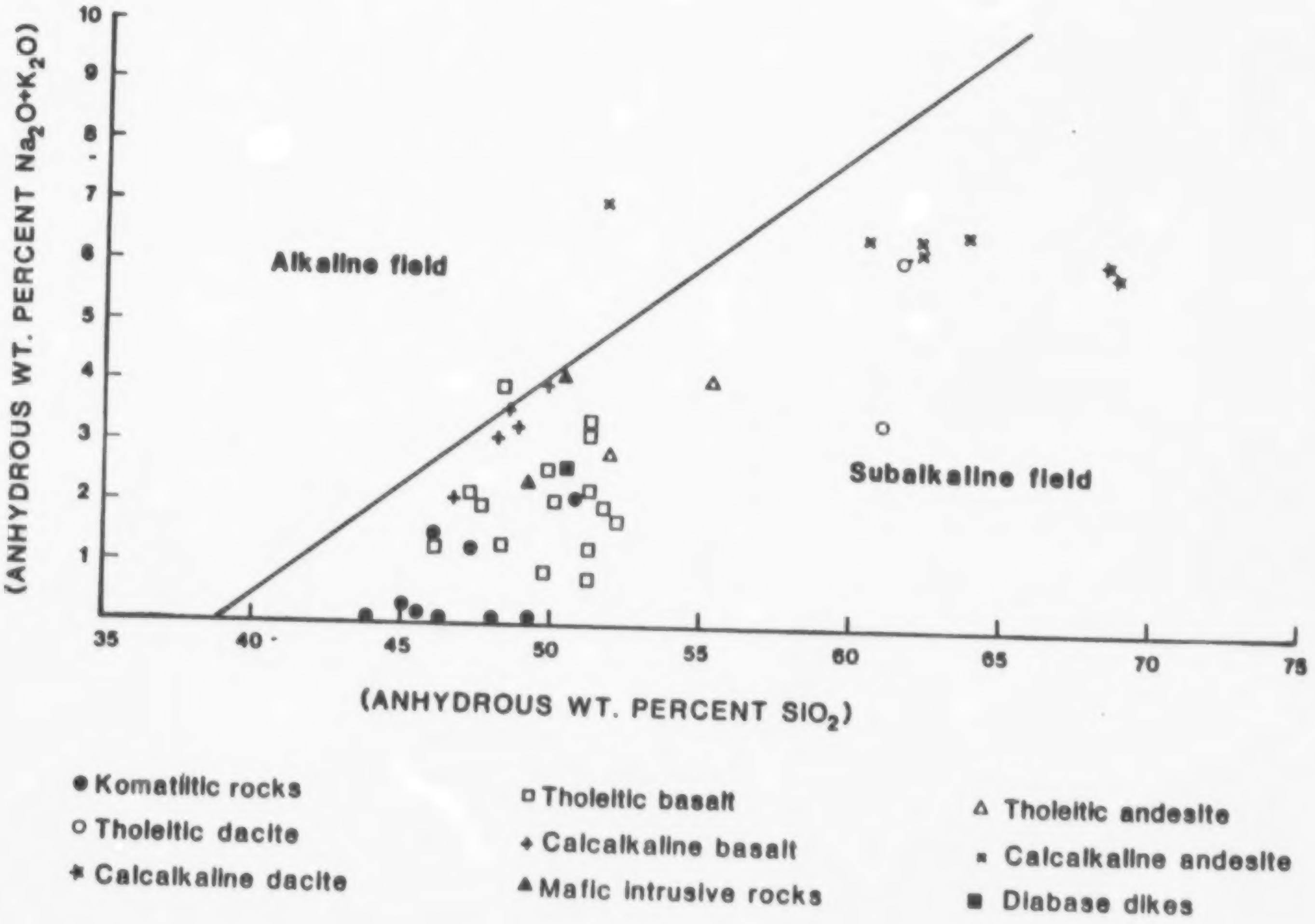

Figure 2. Total alkalies vs. silica plot (Irvine and Baragar 1971) for the samples from the map area, illustrating the subalkaline nature of these rocks.

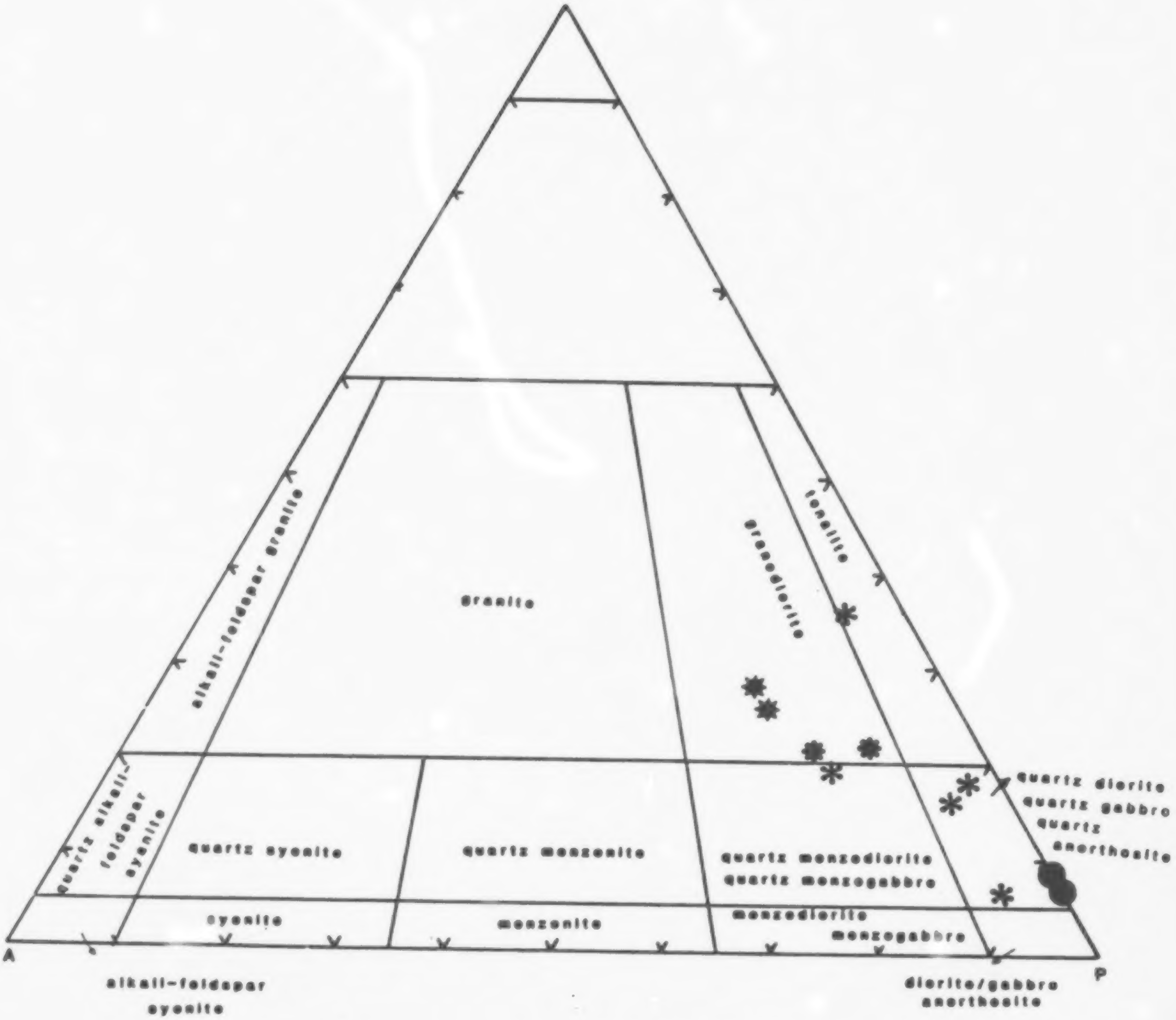

Figure 3. Modal mineral proportions in the intrusive rocks of the map area.

● Quartz Diorite Stock

✱ Quartz Diorite, Quartz Monzodiorite and Tonalite.

✹ Porphyritic Granodiorite.

✷ Leucocratic Granodiorite.

Field boundaries according to Streckeisen (1976).

KEEFER TOWNSHIP

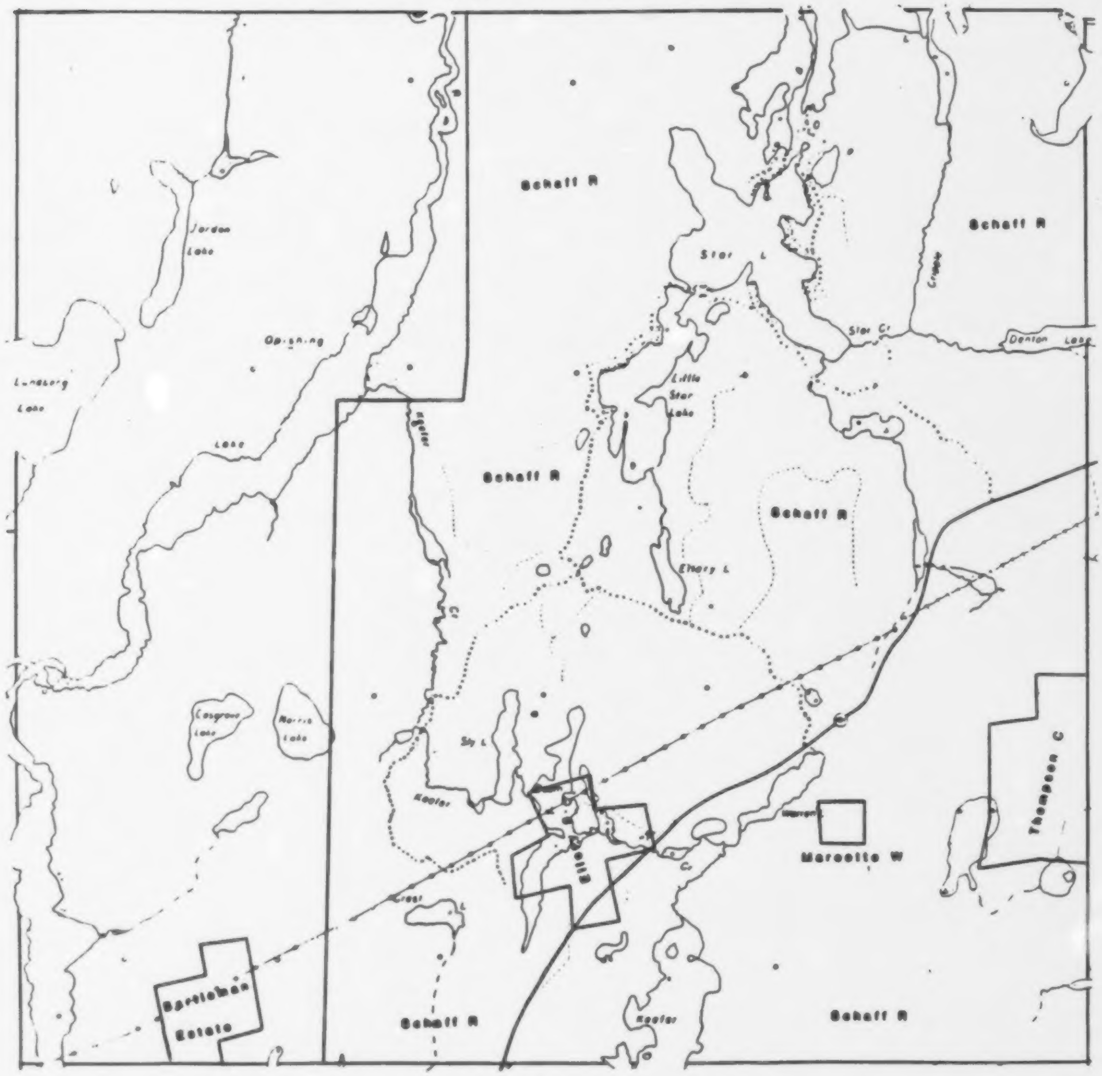
Schaff R
Jordan Lake
Opishing
Lundberg Lake
Lake
Schaff R
Star L
Schaff R
Crosby
Star Cr
Denton Lake
Little Star Lake
Schaff R
Schaff R
Emory L
Cosgrove Lake
Morris Lake
Sly L
Keefer
Crest L
Ellis
Marcotte W
Thompson C
Bartleman Estate
Schaff R
Keefer
Schaff R

Figure 5. Sketch map of Keefer Township showing approximate position and outline of claims in good standing on December 31, 1981.

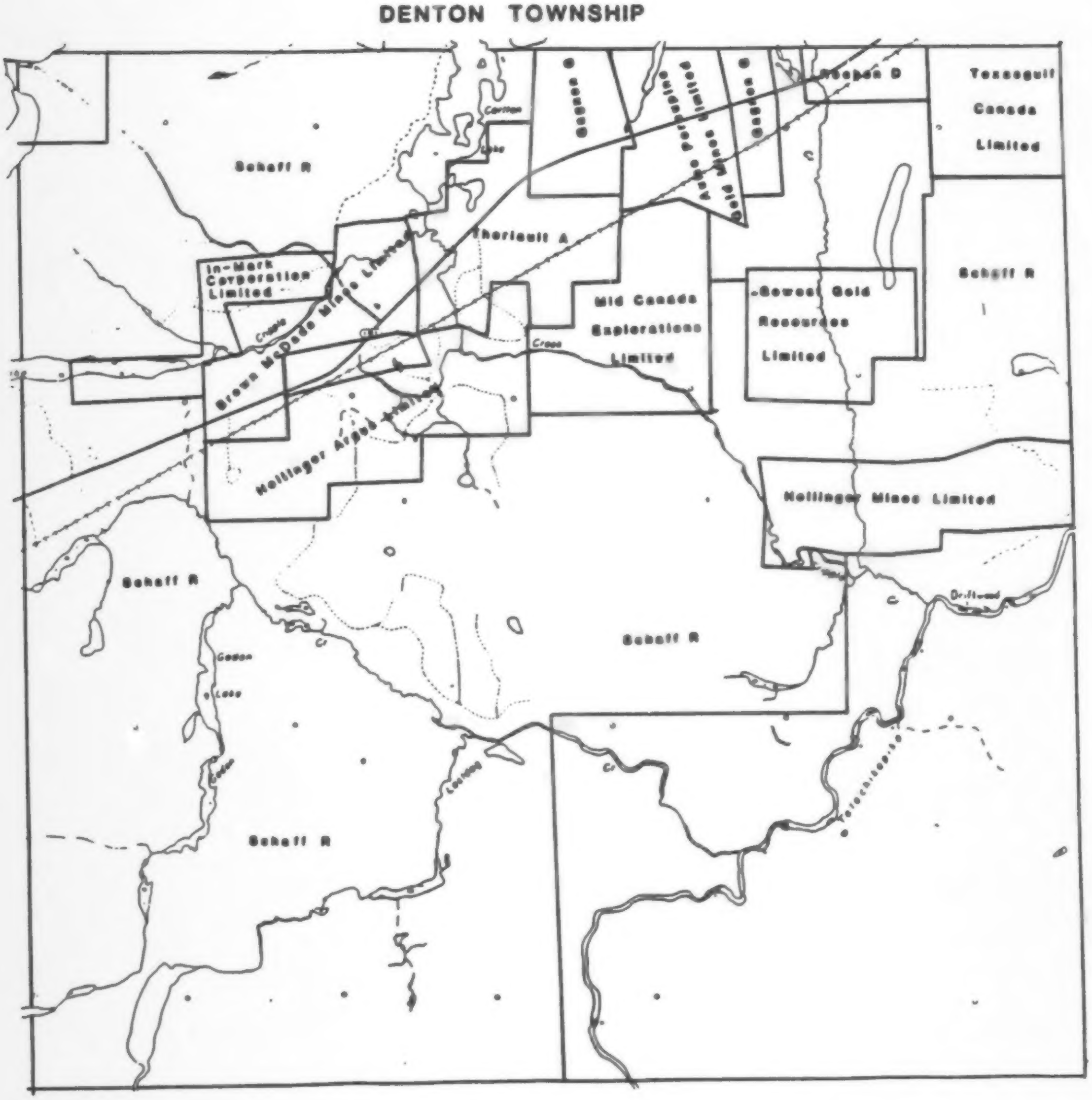
DENTON TOWNSHIP
Schaff R
Carlton
Lake
Gagnon G
Aunor Porcupine
Gold Mines Limited
Gagnon G
Texasgulf
Canada
Limited
Theriault A
In-Mark
Corporation
Limited
Brown McDade Mines Limited
Hollinger Argus Limited
Cross
Mid Canada
Explorations
Limited
Bowest Gold
Resources
Limited
Schaff R
Hollinger Mines Limited
Schaff R
Driftwood
Schaff R
Cr
Schaff R

Figure 6. Sketch map of Denton Township showing approximate position and outline of claims in good standing on December 31, 1981.

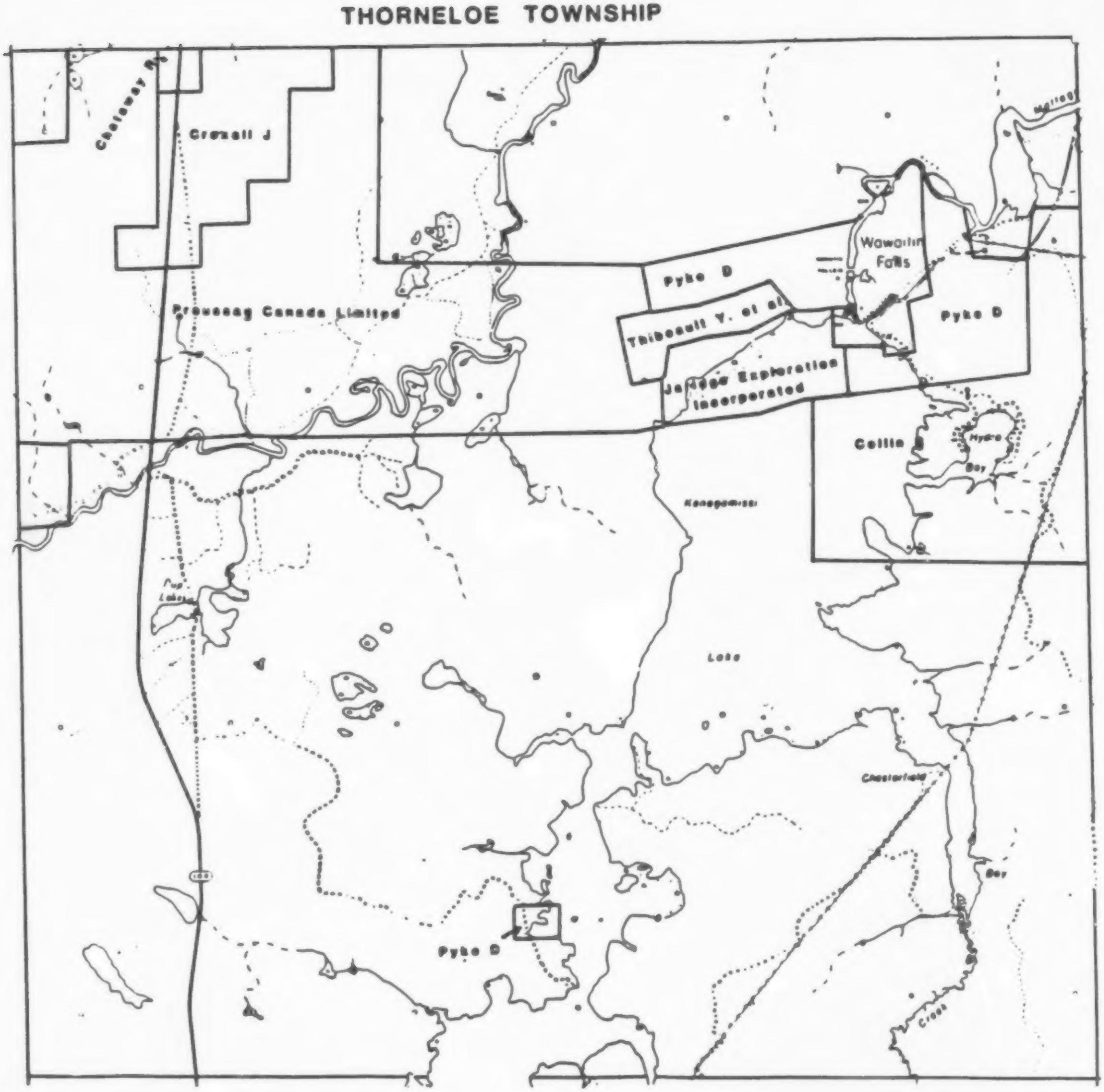
THORNELOE TOWNSHIP
Chateway R.
Crozall J
Preussag Canada Limited
Pyke D
Thibeault Y. et al
Ja[illegible] Exploration Incorporated
Wawaitin Falls
Pyke D
Collin
Hydro
Bay
Kenogamissi
Lake
Chesterfield
Bay
Creek
Pyke D
101

Figure 7. Sketch map of Thorneloe Township showing approximate position and outline of claims in good standing on December 31, 1981.

3268
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MAPS
NOT
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CARTES
OMISES